PISTOLSMITHING

GEORGE C. NONTE, JR.

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Foreword

Gunsmithing is an ancient and honorable craft, rising directly from the skills of the armourers and artificers who produced swords, mail, pikes, et al long before "gonnes" became known. Few artisans were more highly regarded than the 'smith of yore who could, with the crude tools of the times, hand-craft a wheel lock or snaphance from bars of metal.

The typical gunsmith of today stands not quite so high in the public mind, but he who can do true gunsmithing still engenders the highest regard of those who shoot, collect, or merely fancy firearms of all sorts.

In the past, it has been “a gunsmith is a gunsmith” and few have bothered to consider handgun work apart from that associated with shotguns and rifles. In the days when sixgun and rifle were part of daily dress, the man who set himself up to repair guns had to have equal knowledge of both, Winchester and Colt alike, and needed fair ability with scatterguns as well.

Today, though, most shops are not nearly so qualified to repair or rebuild handguns as they are the others. Many a gunsmith who turns out fine rifle work would just as soon a pistol never came across his bench. Not only is this because we live in the day of the specialist, but also because of ever-increasing anti-handgun sentiment, and more repressive laws regarding their possession and use.

As a result of these attitudes, specialists we call pistolsmiths have risen round the country. Some are even divided between revolvers and autos and work only on one, not the other. This new breed of pistolsmiths who eschew long guns, and cater to the pistolero is still far from plentiful. They are scattered far and wide and are often many months behind in their work. More will come, of course, for handgun sales and ownership have boomed in the past decade. The 2½ million new handguns sold last year alone will eventually produce work enough to keep many more ’smiths working for years.

But they come slowly, and even then few will ever be Swensons, Clarks, Pachmayrs, Shockeys, or Behlerts. We’ll never see the time when there is a pistolsmith nearby to meet the needs of all handgun buffs. And it is better that way, really, for working on one’s own guns can be—is—rewarding in many ways. To carefully, albeit slowly, retime an old SA revolver or rebarrel a war-souvenir autoloader to new serviceability, is to feel a kinship with those artisans of old. To take something that doesn’t work and then make it work leaves every person just a bit more than he was before.

There is the economic side of the coin, too. If you’ve a defective gun and can repair it with simple tools, you’ve saved money. If to have it repaired by an expert means shipping it off somewhere for six months or so (and it often does), a weekend repair job saves far more than money.

The only real problem is in learning how to do the job. High schools don’t teach gun repair, and the few trade schools that do are beyond the reach of most of us. We have lots of books on general gunsmithing—though most are well dated—but few of them give more than passing mention to handguns. Our several shooting periodicals run articles now and again on various handgun repairs and alterations, but seldom is the article at hand useful for the job at hand.

It is for those reasons we’ve put together this book. There isn’t really any original thought or work in it. Instead, it contains the gleanings of many books and periodicals, and the gist of many discussions with today’s pistolsmiths and general gunsmiths of the old school. It also contains much of this scribe’s several decades experience in repairing, modifying, and use of every type of handgun.

This book isn’t intended as a scholarly treatise, but rather as a guide for the handgun buff who, for one reason or another, finds it pleasant, profitable, or necessary to do his own repair work. It is meant to be a single-source reference in which you can find some help for almost any problem that arises. It won’t step-by-step you through carving a new gun from bar stock and some of the methods might give an old-time gun artist the quivering fantods. But it does tell you how to keep your guns in top working condition, even if you can never visit a professional pistolsmith.

It has been said that there are at least 40 million handguns scattered around the country. I’ll wager a third of them need repair, and this book will help you make a dent in them.

George C. Nonte, Jr.

CHAPTER 1 - The Law and the Handgun

Almost since the beginning of firearms there have been laws of one sort or another regulating their possession and use. These laws have become so harsh and unrealistic in modern times that in some countries the possession of any handgun is flatly prohibited except by police officers and members of the military establishment. In Japan, for example, no private citizen may own a handgun of any sort. Other countries may be less restrictive, but not much, and there are few nations in which one may possess and use a handgun as freely as here.

GCA’68

Until the passage of the law commonly known as GCA’68, the gunsmith or seller had few rules to worry about, so long as he obtained a Federal Firearms Dealer License which cost a mere one dollar. Since the 13 December 1968 effective date of that law, though, there are many restrictions placed on dealers and gunsmiths, and in particular, upon those who sell or work upon handguns.

Not only are the basic rules and regulations somewhat confusing to the layman, they have unfortunately been the subject of differing interpretations by local and regional agents of the enforcement agency, the Bureau of Alcohol, Tobacco, and Firearms (BATF) Division of the Internal Revenue Service, U. S. Dept, of the Treasury'.

Anyone undertaking repair of handguns, even if only for his own personal benefit and pleasure, is certain to soon be approached by someone (friend, acquaintance, or total stranger) to do a piece of work on a gun. If any such work is done for someone else, one may be eventually accused of "operating as a gunsmith" without a proper license, and then further, of failing to keep the proper transaction records required by Federal laws (GCA'68).

The law is quite vague—perhaps intentionally so—about what constitutes the "business" of gunsmithing or selling guns—and both activities are prohibited unless one is federally licensed and maintains the required records of every individual firearm that enters and/or leaves his possession. Thus, theoretically, if a friend leaves his favorite ·45 auto overnight with you to have a new firing pin installed, you might be accused of operating as a gunsmith without a license. Whether this would ever occur depends upon the individual BATF agent in your area.

For that reason, never take in a handgun which is not your own, without first talking to the local BATF agent and learning what his reactions and views on the subject might be. Even then, if he says something like "Sure, it's okay for a few guns without a license", get that statement in writing. Agents and views change—and the next agent might decide a half-dozen handgun repair jobs constitute a gunsmithing "business" and bust you for unlicensed operation. A letter from the previous agent could easily keep you out of court, or even out of the bastille, under such conditions. A sad state of affairs, but certainly true, and you should be forewarned.

RECORDS

So much for licensing. You cannot operate the "business" of pistolsmithing (gunsmithing) unless federally licensed. For this license, you must apply through your local BATF agent and pay the requisite fee. Once licensed, you are required to keep a permanent "Firearms Transaction Record" for every firearm (not just handguns) that you receive. If a party brings a gun in for repairs, then leaves to return for it later, you must record that gun receipt by make and model, caliber, serial number, type and date of receipt, and indicate the full name and address of the party from whom it was received. When the owner returns to pick it up—the same day or anytime later—you must complete the record, showing the date it was returned to him.

If, however, the owner brings a gun in to you for repair and waits on your premises until the work is finished, and then takes the gun with him, no record is required.

Forms for this Firearms Transaction Record can be obtained from the BATF, or may be purchased from several commercial sources. The detailed requirements for all this are spelled out in the BATF publication "Published Ordinances Firearms" which you will receive regularly as a licensed gunsmith or dealer. This booklet further outlines state and local laws and regulations on the same subject, and you must comply with them also. Your county, municipality, or state may have further requirements for licensing, reporting, and record-keeping which you must meet. The possession of the Federal license and maintenance of federally-required records does not exempt you from other requirements and regulations.

THE LAW'S IMPORTANT FEATURES

A few points:

1) Under Federal law, a gun missing many essential parts, even if disassembled, must still be treated as a firearm, so long as the frame or receiver is present.

2) A frame or receiver must be treated as a complete firearm.

3) An unserviceable firearm—unless formally deactivated in accordance with the law—must be treated as a firearm.

4) Some states and localities require "any major component" to be treated as a complete firearm.

5) Possession of a dealer's or gunsmith's license (Federal or other) does not allow you to carry or use a firearm in any way that is not permitted by other Federal and local laws, i.e., a dealer's license does not allow you to carry a concealed firearm.

6) You may not receive any firearm whose serial number has been altered, removed, or mutilated; you may not alter, remove, or mutilate any serial number—though you may re-apply the same serial number in another place on the same part if the work to be done will alter or obliterate the original marking.

7) You may not fit or make a shoulder stock to or for any handgun; nor may you convert any shoulder gun to a handgun.

8) You are responsible for reasonable and prudent security (from theft or misuse) of firearms left in your custody for repairs.

9) You may not ship any firearm out of the state in which you are located except to another licensed dealer, gunsmith, or manufacturer—except that out-of-state parties may ship a gun to you for repairs, and you may then return that same gun to that same person. Should that gun be unrepairable, you may ship a comparable replacement in its stead, providing to do so is not in violation of the laws and regulations governing the original sender.

10) You may not build from scratch a new gun or remanufacture an old gun, or return to serviceability a properly deactivated firearm unless you obtain a manufacturer s Federal license and then keep the records required of that license.

11) You may not convert a semiautomatic (selfloading or autoloading) gun to fire full-automatically (machine gun fashion).

12) You may accept firearms in trade (for work), but if so, they must be recorded in your Firearms Transaction Record, just as if they were being acquired for resale.

13) Any sales or exchange of firearms you might make must be properly entered as such in your Firearms Transaction Record, and must be accompanied by a properly executed "Form 4473" as required for all retail sales. In short, you cannot, once you are licensed, accept any incoming firearm as "personal property" and thus avoid recording it. The item must be properly recorded, then if you wish to appropriate it as personal property, the record must be completed, showing it transferred to you personally, just as if it had been sold or otherwise transferred to another party.

14) Once licensed, you cannot loan a firearm to any person unless the transaction is recorded as a transfer in your Firearms Transaction Record.

15) All ammunition and components suitable for use in handguns are subject to essentially the same restrictions as the guns themselves.

Those are the essential requirements of the law. You'll find them elaborated upon in detail in Published Ordinances Firearms. Should you wish to sell handguns and ammunition (or any other firearms) then you must comply with all the Federal, state, and local laws and regulations which apply. You'll find them outlined in detail in Published Ordinance Firearms. So, a thorough study of this booklet is essential before you go into such business.

Aside from the effect of the law on your pistolsmithing outside of your own guns, GCA'68 has a profound effect upon your own possession, use, and acquisition of handguns.

First of all, you may not acquire or possess a handgun if:

1) You are under 21 years of age.

2) You have been convicted of a crime for which you could have been sentenced to more than one year in prison.

3) You have been adjudged mentally incompetent or have been involuntarily committed to a mental institution.

4) You are a known drug addict or chronic alcoholic.

5) You are otherwise prohibited by state or local laws or regulations.

To purchase a firearm from a licensed dealer you must:

1) Satisfy the seller as to your age and identity.

2) Execute and sign Federal form 4473.

3) Comply with all pertinent state and local laws and regulations.

4) Make the purchase within the state of your residence.

Thus you can see that Federal law alone does not particularly interfere with acquisition and possession of handguns except that it prohibits purchase—either personally or by mail—outside your home state. Even then, when consenting laws are passed (as has occurred in several instances), you may purchase in a contiguous (adjacent) state.

State and Federal laws are another matter and range from innocuous to totally prohibitive. Again, check in Published Ordinances Firearms to determine their effect on you personally.

CHAPTER 2 - A Place to Work and the Tools Needed

A fellow I know was once bedridden for quite some time, and during that period he worked actively as a pistolsmith. He did superb revolver tuning, auto accuracy jobs, and general repair, working at a lap board across his knees in bed. From that you can see that an elaborate shop setup isn't needed; handy, maybe, but by no means essential.

THE NEEDED WORK SPACE

Pistolsmithing is, fortunately, a specialty requiring very little space. When professional 'smiths are sent by the factories to work at matches around the country, they arrive with a small toolbox, a small portable vise, and, perhaps, a folding table; that's all they need.

You can get by just as well in the beginning. A medium-size vise clamped to the kitchen table, and a good strong light source are all you'll need. With tools handy in a drawered box or chest, you'll be set up for any job short of machining or replacing revolver barrels. I've repaired or overhauled hundreds of handguns on a kitchen table just like that, and also at my desk in various parts of the world.

Handgun work, by its very nature, is mostly close hand work with small tools—shown clearly here by the complete setup used by S&W factory gunsmiths as they travel to various matches. With the few tools shown here, set up on folding table in a house trailer, they do everything from minor repairs to complete rebuilding.

Unfortunately, there aren't many hours between meals when the lady of the house might let you set up shop in the kitchen. You'll be better served if a table or bench can be set up permanently in some low-traffic part of the house. If you keep things picked up and clean, the bedroom isn't a bad choice. I know one fellow who makes complete guns from bar stock in his bedroom, where he has a miniature drill press, lathe, and milling machine set up on the top of an extra bureau. Any work he turns out there is better than you'll find coming from some pretty large and expensive custom shops.

The basement is okay if it remains dry, otherwise guns and tools will rust too easily. If it's just a bit damp, consider setting up a dehumidifier and do your work there. A garage isn't bad either, but there is usually too much dust and dirt blowing around in a garage in use, and most get a bit chilly in wintertime. Anyway, pick a small area that is warm and dry, and where you won't be bothered. A solid bench will make many jobs easier.

Filing and peening operations will suffer if the work piece isn't held steady. If you don't have something handy, get a set of steel workbench legs and attach them to a thick plywood top, or a top made of a pair of 2 x 10 or 2 x 12 planks cleated solidly together. The bench need not be large; 20 x 36 inches will be adequate if you're tight for space. Make certain it's level and solid; shim the legs as needed so it won't wobble.

Bolt a good vise solidly to the bench—the type and size we'll cover later. A vise is essential if accurate work is to be done. Light, too, is vital. You need lots of illumination. The best thing I've found for overall lighting is a two- or four-tube fluorescent fixture as long as the bench and hung on chains about two feet over the bench. If it is simply hooked into the chains, it can be raised and lowered to suit. Then, a separate mobile light is needed for seeing down into actions, receivers, and the like. One of the small, gooseneck, high-intensity lights advertised widely is good for this. Its beam can easily be directed anywhere.

Some kind of a tool rack over the bench will help, as will a couple of plastic drawers hung beneath. A strip of flexible magnet on the wall is fine for holding small punches, screwdrivers, and files. One of Brownell's magnetic mats on the bench will prevent loss of small parts in gun disassembly.

A lot of work is done standing, especially filing and polishing, so a soft mat on the floor will make it more comfortable. For sitting-down work try to find an old adjustable-height stool.

For fine work you might add another bench accessory, an illuminated magnifier on an adjustable or flexible stand. It's great when you're polishing sear noses and hammer notches, and will easily save its price in ruined parts and easier, quicker jobs. Be sure also to set up a couple extra electrical outlets on or near the bench for lights, soldering iron, Moto-Tool, etc.

It's also a good idea to close the work area off from the rest of the family. Best, of course, are walls and doors or a separate room. Lacking that, though, just fence off the area with cheap canvas or burlap curtains, or drapes hung from the ceiling. And, for comfort, and to disperse fumes and dust, rig a small exhaust fan of some sort. Soldering, polishing, bullet casting, and heat treatment will now and then fill the air (and your lungs) with debris and odors if the air isn't stirred up a bit. A simple, cheap, dimestore electric fan set near an open window is adequate. That's about it for simple work. If you add a drill press or other power tools, you'll need more room, and solid bases for them, and if you take up bluing, that equipment should be set up in a separate, heavily ventilated room. But that's all in the future.

If these last few paragraphs have made you hesitate, just remember that a lot of perfectly good work can be done on the kitchen table or bedroom bureau. The rest is just nice to have and it probably will come in time if you do enough work.

TOOLS

Anyone who has never attempted any handgun disassembly or repairs before may well be confused as to just what tools are essential, or at least desirable. While many professional and amateur pistolsmiths have extensive machine shops equipped with thousands of dollars worth of power tools, ranging upward from lathes and grinders to milling machines, the average handgun repair job can be accomplished with nothing more than common handtools and a good bench vise. So let's start with the barest minimum of handtools you'll need and work our way upward, covering tools and tool types individually according to the type of work they will allow you to do.

Screwdrivers

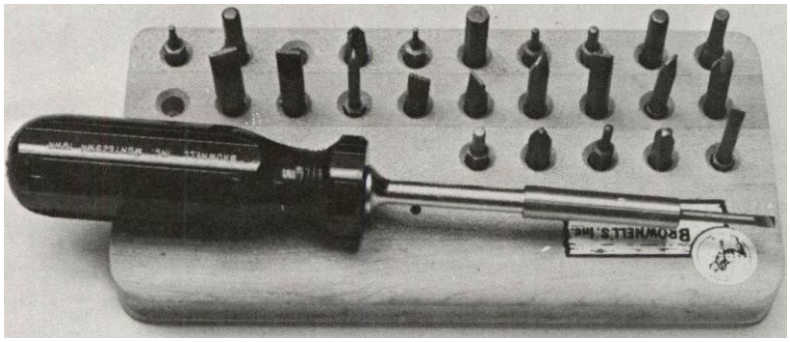
Probably the most important tools the amateur pistolsmith should own is a set of best-quality screwdrivers. Department store and the usual hardware store screwdrivers are seldom adequate for gun work. Handguns, and particularly revolvers, contain numerous small-diameter, fine-thread screws with small heads and thin slots. Moreover, those screws are seated quite tightly. Generally, attempting to remove and replace gun screws with standard screwdrivers results in, first, the driver slot being distorted by the too-thick, tapered blade; second, the wedge-shaped blade jumping out of the slot and gouging a big scar across the gun's surface; and third, the driver blade breaking or bending.

The smart thing and the best investment is a set of "gunsmith" screwdrivers. Bonanza Sports and Grace Products both offer excellent sets of different designs. The Grace drivers have the typical flattened blades which are ground parallel for a short distance at their tip, while the Bonanza drivers have short, rounded bits. In theory, the latter are more sturdy, but I have yet to notice any difference in actual strength.

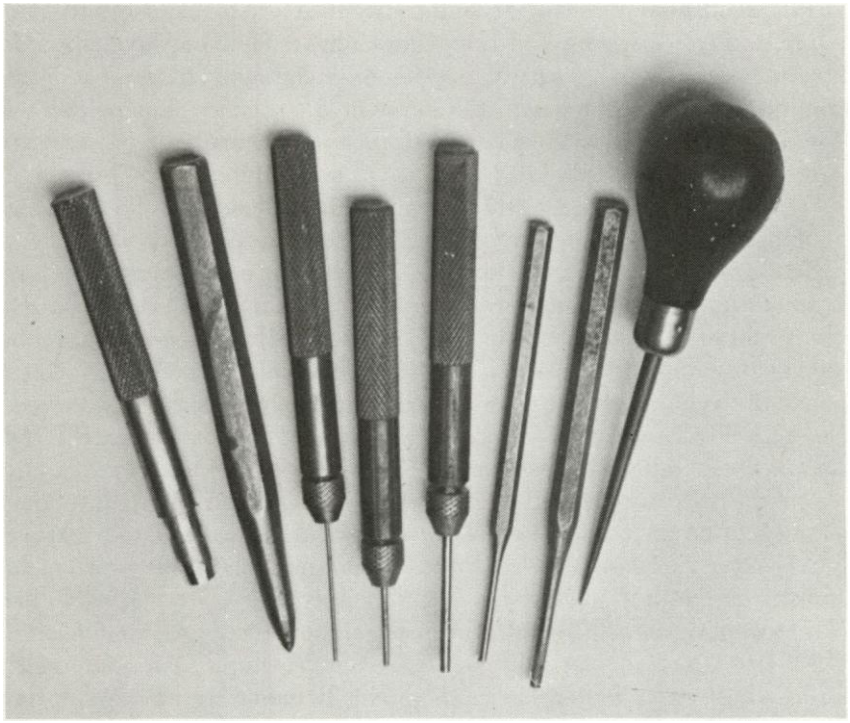
There are also a number of replaceable-bit driver sets, the most common being those sold by Brownell. In this type of set a single socket-type handle is supplied along with an assortment of short insert bits. For only occasional use, I have found these drivers to be the most economical and versatile, while for steady use the one-piece drivers are better, although more costly.

Unfortunately, even the finest and most expensive set of professional drivers will not fit all of the screws on all of your guns. To prevent damage to the screw and possibly to the gun, driver bits must fit screwhead slots precisely and must have parallel sides. If the bit is the least bit wedge-shaped, it will jump out of a screw slot and gouge the gun, or poke a hole in your hand, or both. Besides being the right thickness to just barely enter the slot to its full depth, the driver bit must be wide enough to occupy the full length of the screw slot. If it doesn't, the slot will be distorted and often you'll not be able to exert enough force to remove the screw properly. Your best bet is to buy a set of drivers and then carefully file or grind their bits to exactly fit the slots of the guns you'll be working on. Then, as additional guns come along, buy additional screwdrivers and grind them to fit, too. Store or label them so that you'll always be able to pick the correct one for, say, a S&W N-frame side plate screw or a Colt sight-installation screw. Eventually you'll have a dozen or so drivers altered specifically to fit certain screws in certain makes and models of guns.

As a general rule, always buy drivers with the shortest practical blade. It is twice as easy to remove revolver side plate screws with a two-inch bit as it is with the more common three- to five-inch bit. Standard square-shank drivers are difficult to alter, but the round-shank drivers, such as those supplied by Bonanza, can be cut to any length and filed to shape easily. When a blade is shortened, it should always be heat-treated and tempered, otherwise it will usually be too soft and will bend or twist.



This interchangeable bit magnetic screwdriver set from Brownell's can substitute for a wide assortment of separate drivers if you don't lose the bits. Tough, to stand hard service, they can still be filed to fit screw slots, and replacements are available.



You'll need lots of drifts and punches. L to R: steel body with replaceable brass tip; stippling and staking punch; next three are Brownell punches with replaceable tips; two conventional hardware store pin punches; last, a hardened, polished scribe.

Punches and Drifts

Punches and drifts are essential for proper and safe disassembly and assembly of most handguns. The common hardware store small-diameter punch generally has a working end much too long for gun use. I've found that one to 1½ inches is more than ample for any handgun application. After all, you'll never have to reach more than that through a Colt or Browning frame to remove a pin. The long two-to three-inch shanks found on most punches make precise control difficult and they often bend easily. I generally buy a good brand (such as Miller Falls) at the hardware store, cut off the excess length, polish its tip, and then heat treat and draw it before use.

My most commonly used punches range from 3/64 of an inch diameter up through 1/8 of an inch, in 1/64-inch steps. Actually, most jobs can be handled with 1/16-, 3/32-, and 1/8-inch-diameter punches. They take care of removing and replacing pins, but relatively soft drifts are also required for driving tight fitting bushings or inserts into place and for installing and removing sights from their dovetails. For this purpose, short lengths of 3/16 or 1/4 -inch-diameter brass rod are almost the universal choice. Copper will do as well, and neither of these metals will mar polished steel, unless they strike it on a sharp edge.

Recently, some gunsmithing supply houses have started supplying lengths of Nylon rod and these make the best drifts of all, except where great force must be applied. Nylon will not damage the gun surfaces under any conditions, except when a very thin edge is struck sharply. Brownell supplies an excellent such rod and is now offering a detachable-tip drift, consisting of a steel or aluminum body into which brass or Nylon drifts of various sizes and lengths may be screwed. These are quite handy for occasional use, but for continuous use the simple short rod is the most convenient.

As with pin punches, drifts should be relatively short, just long enough to be held conveniently with thumb and forefinger and struck safely by a hammer. The longer the drift, the more likely you are to make a slip with it.

A staking punch is most useful for tightening screws and pins in their holes and for securing sights and other items. You can easily make one from a tool-steel center punch by grinding its point to an angle of 65 to 80 degrees, making it quite sharp and smoothly polished.

Files

Probably next in order of importance are files. For simple jobs requiring leveling a surface (such as the muzzle of an amputated barrel) a double-cut smooth bastard file is handiest of all. Nearly an inch wide, it will cover any gun surface you'll be working on in a single pass and is large enough to be handled easily and accurately. A narrower six-inch file of the same cut will occasionally be useful, but there's no point in getting it until you need it.

Most useful, though, for numerous deburring, smoothing and tuning operations on both autoloaders and revolvers is a set of top quality Swiss needle files. While a complete set is great to have, I feel most jobs can be done with a round-tapered, round-straight, half-round, flat and square needle files, along with a slitting file for recutting screw-heads, slots, and opening up rear sight notches.

Every file you use should be equipped with a substantial handle. Common wood handles are available in several sizes and are simply driven on the tapered tangs of conventional files. Needle files can be purchased with plastic handles already installed, or you can buy a detachable handle that clamps on their straight shanks by a collet or thumb nut. I keep two or three of these at hand. An even cheaper solution is to cut lengths of half- or three-quarter-inch diameter dowel, drill holes in them, and epoxy them onto your needle files' tangs. Without handles, you'll have very poor control over your files, and in case of a slip, you're quite likely to puncture your hand on a tang.

To keep files in good working condition, a file card and chalk are invaluable. If files are allowed to become clogged, they can spoil the surface on which you're working.

Types and shapes of files needed. Protect them in cardboard scabbards to prevent damage.

Stones/Abrasives

Small shaped abrasive stones, commonly called Arkansas stones or slip stones, are extremely valuable for internal smoothing of lockworks, slide ways, locking surfaces, etc. Their function is to polish contact areas smooth while removing as little metal as possible. They are available in varying degrees of fineness and hardness, but the best for polishing the hardened parts in handgun actions are the so-called hard Arkansas stones which are found in the smaller sizes. They are creamy white in color and their thin edges are relatively fragile. Consequently, they require careful storage and use. A knife-edge stone is of little value if you chip out its sharp edge on the first few strokes. For many years I have used those stones supplied by A. G. Russell with complete satisfaction.

The coarser stones, usually not available in the smaller sizes, are called soft Arkansas or Washita. They are convenient when a significant amount of metal must be removed rapidly. They really aren't necessary unless you're trying to do a rush job by polishing first with a soft stone and finishing with a hard one. It's better, though, to do the entire job with a hard stone.

Plastic strips coated with fine abrasives are also available and they make an excellent substitute for stones. They may be bent to various curves and angles and cut into small pieces and cemented to handles for reaching down into holes. One brand that I have been using comes from Brownell's and is called simply "flexible file". They are quite useful, long-lasting, and economical, and you should have a couple of the finer grits because they can pull many a simple polishing or shaping job out of the fire.

Vise

Of course, to go with these tools you'll need a good, solid bench vise. The best all-around choice is a four-inch, heavy-duty, swivel-type bench vise equipped with protective copper or lead jaws. Dozens of makes are available, but frankly I've found it difficult to beat the ones sold by Sears for $30 to $40. In addition to a bench vise, there are other lightweight vises which are particularly useful for holding either a complete gun or its parts for more delicate work. The vacuum type weighs only a few pounds and uses a suction cup which can be secured to any smooth surface. It is available with either plain or swivel jaws, the latter being the most useful.

With a vise of this sort available, you can sit down at the kitchen table, set up the vise in front of you, and proceed with a wide variety of light work that would otherwise keep you humped over a bench vise. I regularly use one at my desk for small handgun jobs and thus avoid having to scoot back and forth between office and shop.

Other Small Tools

You'll also need two or three hammers. For light work I use a four- ounce machinist's hammer and for heavy jobs, like driving out rusty pins or some sight-staking jobs, an eight-ounce hammer. For rapping revolver frames to loosen side plates a small plastic-faced hammer is necessary. And if you have a really difficult job requiring a great deal of force—such as a ·45 auto slide bent and jammed on its frame—a heavier lead hammer might well come in handy, but it's one of those things you can do without until you actually need it.

If you'll ever be shortening any barrels or amputating butts or trigger guards, a first-class, heavy-duty hacksaw is essential. I prefer the adjustable Stanley frame with high-speed steel blades, 24 teeth to the inch. A coarser blade is difficult to handle and will hang up when you're cutting thin metal.

A good pair of pliers or two will come in handy for a number of jobs, but the common slip-joint type found around most homes isn't a very good choice. Good, medium-length, needle-nosed pliers are useful for placing and removing some parts and for holding others. Another type you should have is the parallel-jaw type with a shallow groove or two in the jaws which allows precise and firm holding of pins and screws without damage. These, too, should be of best quality.

Somewhat related to pliers are snap-ring tools. While most handguns do not contain snap rings, a few of the recent designs do, as do several of the customized combat and target conversions of big-bore autoloaders. If a proper tool is not used for removing snap rings, the gun's surface will be badly marred.

If you will ever get into repairing, making, or refitting grips or stocks, a few small wood working chisels and rasps will be required. I've found that a small set of short wood-carving chisels and gouges is more than adequate for this type of work. You won't need the large set of a dozen or so sizes and shapes generally sold for carving. Instead, make up a set consisting of ⅛- and ¼-inch flat blades, ¼-inch round, and small and medium V-gouges. You will also need stones to keep them razor-sharp for smooth cutting.

Obtain a small combination rasp, coarse and fine and half-round on one side, and coarse and fine and flat on the other side to serve for rough shaping stocks. Add to this medium-cut round files in ¼- and ½- inch diameters and you will be set for any grip-fitting job. If you'll be cutting grips out of solid wood stocks, you'll need a coping saw, too.

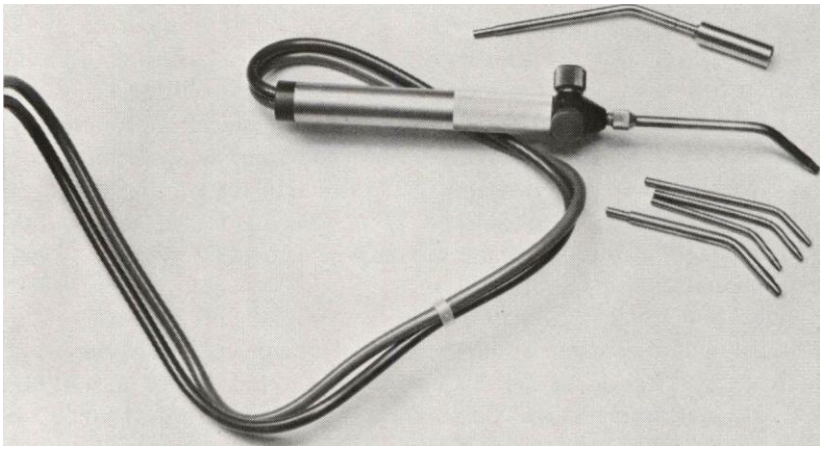
A bench block is by far the safest and most convenient method of drifting out pins and it also protects your gun's surfaces. It is nothing more than a polished steel block with a number of different-sized holes drilled through it. You can buy a finished block, but it will cost several times more than one you can make out of scrap hardwood.

The checkering, grooving, or serrating and stippling or matting of sight blades, sighting ramps and ribs, front and back straps, and triggers or other surfaces will require special files, punches, and chisels or gravers.

Torch

You should have a soldering torch, and since silver soldering or hard soldering is far superior to the soft variety for handgun work, it should be capable of generating temperatures up to 2500 degrees Fahrenheit or more. The common propane torch, such as the model sold by Bernz-O-Matic, will do the job reasonably well but requires quite a long time to heat large parts well enough for a good hard- soldering job. A better choice would be the air-gas type, and even more useful is the recent Solid-Ox type, which generates oxygen in a closed container by burning chemical pellets and mixes it with propane for an excellent soldering and welding flame.

Handgun work seldom requires welding, but if you have the Solid- Ox type of torch for soldering, then you're prepared for any light welding job that should arise. The cost of this kind of unit is really quite reasonable, on the order of $40 from several mail-order sources.



Miniature oxy-acetylene torch and tips from Brookstone will handle most handgun work. Upper unit is gas/air tip for soldering.

Grinder

The one power tool that is the most useful in handgun work is a top-quality hand grinder. Several makes and models are available, but for many years I have used a variety of small and highly convenient models made by Dremel and sold under the name of Moto-Tool. Depending upon the model, this tool turns up 20,000 to 30,000 rpm and accepts an almost endless variety of abrasive points, brushes, sanding drums, cut-off discs, etc. No other tool will do scores of handgun jobs as well as this one.

It may be used for polishing, grinding, cutting, drilling (either free hand or in a drill-press accessory kit), sanding, and cleaning, to name a few jobs. Without it, you might spend hours tuning or throating an autoloading pistol to handle wadcutter or high-performance cartridges, yet with a Moto-Tool the entire job can be completed in five or ten minutes by using the proper polishing and grinding points. It is also invaluable for sharpening cutting tools.

If you can afford only one power tool, by all means invest $30 to $40 in one of these kits, complete with an assortment of accessories and points. The most recent Dremel development is a variable speed Moto-Tool, and I have found it to be the most useful of all.

Your beginning power tool, and destined to be the most used of all, is inevitably a small but powerful hand grinder such as this model by Dremel. Several models are available, the most recent containing its own built-in speed control.

Various “gunsmith” assortments of round spring stock (shown), fiat spring stock, and tool steel are almost worth their weight in gold.

MISCELLANEOUS SUPPLIES/SAFETY ITEMS

In addition to tools, you'll need numerous expendable supplies. A typical list would run like this:

Fine- and medium-grit abrasive cloth and paper
Solvent for cleaning parts
Rust remover, such as Naval Jelly
Oils and lubricants
Assorted-diameter lengths of drill rod
Epoxy cement
Glass-bedding compound
Small pieces of scrap steel and brass
Fine steel wool
Touch-up blue
Stock finish
Loc-Tite
Q-tips
Small wooden sticks
Hard solder and flux

You should also have safety glasses or protective goggles, gloves, and a shop apron or smock to protect your body and clothing. Safety glasses are absolutely essential when doing any grinding or drilling, and should also be worn any time a hammer and punch or drift are being used. Grinding and polishing wheels and points sometimes break, and chisels and punches sometimes throw off metal fragments. When this happens, you could lose an eye if it's unprotected.

Gloves, too, are essential when any soldering or welding is being done, as is the apron. All of these safety items are also essential if you do any bullet casting. I collected a number of burn scars and plenty of scorched clothing before I finally recognized that molten lead could be quite hazardous.

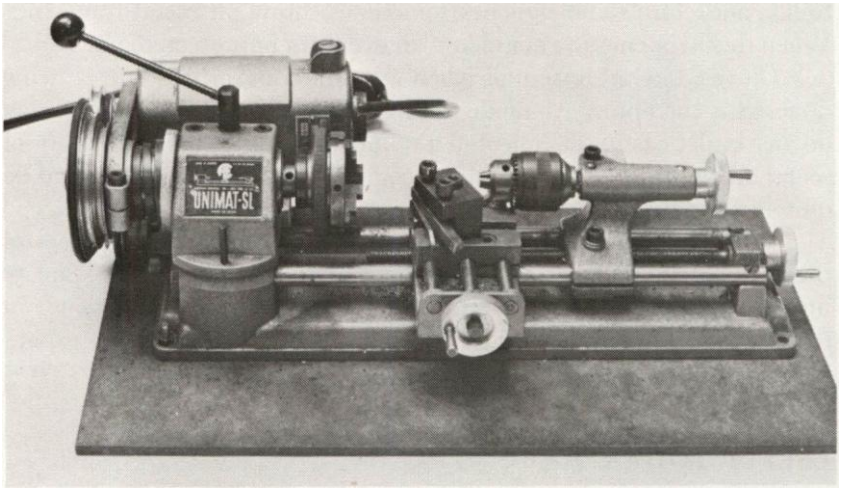
All the foregoing hand and power tools will handle 99 percent of the repair, modification, and refinishing work that you might want to undertake at home. Should you decide to do some work for friends or to earn a few dollars moonlighting, or perhaps even try some experimental work, a few heavier power tools will be of great value.

USEFUL POWER TOOLS

While a standard drill press isn't necessary unless you become deeply involved in commercial pistolsmithing, it is a considerable convenience, and a half-inch chuck and an assortment of high-speed drills make it most useful. This need not be an expensive ball-bearing-equipped machine. A number of light to medium-duty presses, available from mail-order sources such as Sears, are quite satisfactory.

One of the most useful power tools in my shop is a two-inch belt sander. The one I'm using was obtained from Brownell for about $50, with a rig that may be positioned vertically or horizontally, and it is easily moved from one place to another. Depending upon the abrasive belt used, it is great for polishing, sanding, and light grinding. Replacement sight blades, pins, and the like are more quickly shaped and polished on it than on any other tool. For example, forming a flat sighting surface on top of a big auto pistol's slide can take a half-hour or more with files, yet it can be accomplished most accurately on a belt sander in only a few minutes.

A bench lathe is truly a luxury, unless you're going into full-time gunsmithing, or pick one up at a giveaway price. However, there are jobs for which some sort of lathe are a great convenience. The little Unimat miniature lathe can be a life-saver for some jobs. Costing approximately $225 in basic form, it is lightweight, occupies very little space, and will do about anything a larger machine lathe will do, but on a smaller scale. It can drill, turn, polish, mill, and even be set up as a small drill press. For making pins, bushings and sleeves, firing pins, for shortening screws or thinning screw heads, trimming or altering cartridge cases, and for making small tools for special purposes, it is invaluable. Mine sees almost as much use as the belt sander.



This little Unimat miniature lathe won't handle heavy jobs, but will easily make firing pins and other pins and a variety of small parts. It is small enough to fit in a briefcase and can be set up on your kitchen table as needed.

Should you decide to go into refinishing work, a bench grinder with extended shafts and an assortment of abrasive and polishing wheels is absolutely essential. You can do a perfect job of polishing one or two guns purely by hand, if you care to spend all the time and effort which hand polishing requires. However, the job that requires eight or ten hours of laborious hand labor can be accomplished in half an hour or so with proper power driven wheels. Ideally you should buy a unit that can be used with either grinding wheels or various sorts of abrasive polishing wheels. The selection of wheels and abrasives for polishing becomes rather involved and is covered elsewhere in this volume. At this point let's just say that quite a number of different sizes and types are needed to do first-class polishing.

If you obtain a belt sander, a bench grinder isn't necessary. It will come in handy, however, and it is often possible to find double-shaft grinders quite reasonably priced in a second-hand store, especially if you shop those stores which are located around industrial areas.

About the only machine tool not yet mentioned which could occasionally be useful is a milling machine. They are expensive, fully as much so as a big lathe, and are not truly needed unless you plan on going into extensive commercial pistolsmithing, or customizing handguns and making special accessories.

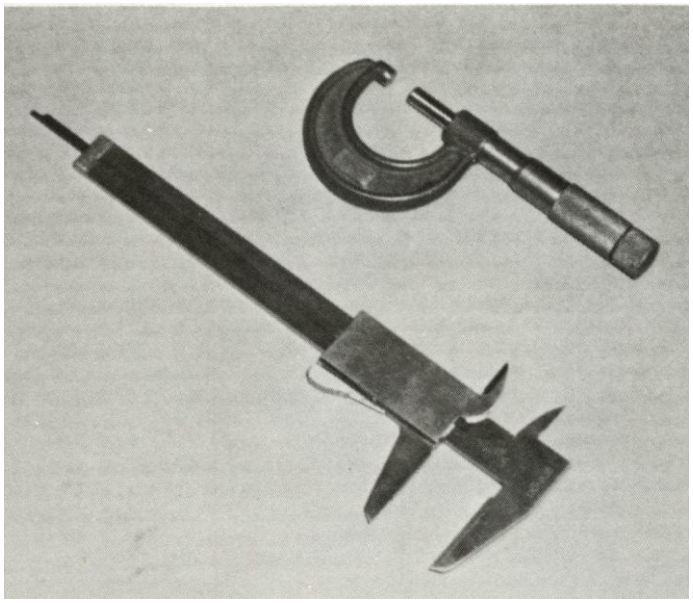
Making sighting ribs and sights, or machining tops of slides to provide an integral rib, for example, requires a milling machine. Shortening and reshaping frames and slides and making lightening cuts in various parts, are also best performed on a milling machine.

Nevertheless, you could probably work on handguns the rest of your life and never really feel any pinch for a mill. But if you can't get along without one, I'd suggest careful shopping among the mail-order suppliers of used machine tools rather than buying a new one. Often small bench mills can be obtained for only $200 or $300 (plus shipping), whereas a new mill of similar capabilities would cost several times that amount.

OPTIONAL—WELDING EQUIPMENT

Another specialized item you might need if you get deeply into sophisticated work is welding equipment, however, it's seldom required in pistolsmithing. While I have welding equipment, I've found it far more economical and practical to farm out the few welding jobs that crop up. Handgun welding is small, precise work that requires a high degree of skill and dexterity if it is to be done satisfactorily.

In the end, though, oxyacetylene welding equipment is the most practical, while heli-arc is the most desirable from a technical point of view. The latter is literally essential if welding is to be done on lightweight aluminum-alloy handgun frames.



Among your very first purchases of precision tools should be good-quality measuring instruments. A 0-1 inch micrometer is essential, and a good 6-inch vernier caliper runs it a close second.

MAIL ORDER ITEMS

Brownell's, Inc. (303 E. Main, Montezuma, Iowa) and Frank Mittermeier (3577 E. Tremont Ave., New York, New York) specialize in gunsmithing supplies and equipment and offer every need you might have. Larger mail-order and tool-supply houses can supply many of the same items, while any well stocked hardware store will have most of the handtools. It's a good idea to obtain their catalogs and study them before making any purchases.

Most pistolsmiths I know buy their specialized items from the gunsmithing supply houses and then buy most everything else locally.

CHAPTER 3 - Files and Filing

If I had a hammer (even a rock) and metal and fire, I could make a chisel. With that chisel, hammer and fire, I could make a file.

With those three basic tools, assuming energy enough, I could eventually make every other form of handtool. With each new tool made, the making of a greater variety of additional tools becomes possible—but the file is basic to it all. All of which is intended to impress on you the importance of files and their uses to pistolsmithing. Files are the most efficient, accurate, and economical handtools available for shaping metal by removing moderate amounts of excess material. If I had a choice of one tool to be marooned with, it would have to be a file.

The big, rusty, clogged, flat file laying out in the garage won't do. For gun work you'll need an assortment of shapes and sizes of good quality. In the common sizes and shapes, Nicholson and Disston are hard to beat and can be had at your favorite hardware or department store at good prices.

In this area, you'll need the following:

*1	8 or 10″ double cut, flat, bastard, fine cut
1	6″ double-cut, flat, bastard, fine cut
1	6″ triangular, fine cut
1	8″ tapered round, (rat-tail), medium cut
1	6″ ¼″ diameter or smaller straight, round, fine cut
*1	6″ pillar, fine cut
1	12″ striking, single cut, medium

Of small files, you'll need several, and they are best purchased from a gunsmith supply house.

*1 set of best needle files you can find, including at least flat, triangular, tapered square, round, knife edge, and slitting patterns
1 dovetail file
*1 screwhead file, small
1 metal checkering file, 30 lines per inch

Of course, you don't need all these at once. Over a score of years ago, I completely rebuilt a ·45 DA revolver, shortened its barrel, dehorned its hammer, fitted new sights, cut out the trigger guard, and checkered the backstrap, using the only file available at the time—a new 6″ fine bastard which was bought at a local dime store and fitted to an old, wood screwdriver handle. A lot of filing went into that job and it could have been done better in half the time if only a couple more sizes and patterns had been available.

The bulk of your work will be done with those indicated by an asterisk (*), so get them first, then add the others as actual need dictates.

THE FILE AS A FINISHING TOOL

To use and maintain files properly, you'll need a file card (a fine brass bristle brush), talc or chalk, file handles (never use a file without a handle), and a means of storing them so they won't get knocked about and dulled. For the latter, needle file sets usually come in a compartmented block or box. Larger files can be hung on the wall, laid in sawcuts in a piece of wood, or slipped into taped cardboard sheaths.

Keep grease and oil away from files; a greasy file will slip and skid, cutting poorly and scarring the surface. Avoid rust by using VPI paper. If grease does get on your files, scrub it off with solvent and an old toothbrush. Also, always scrub grease, oil, and dirt off the metal which is to be filed.

Never use a file to remove more than a few thousandths of an inch of metal. Sure, you can wear away a quarter-inch with a file, but the amount of time and energy required becomes ridiculous. A hacksaw and bench grinder are much more efficient in hogging off the excess, almost down to the desired level—after which the file is the preferred tool to finish the surface. Always scribe clear and accurate lines to serve as guides for filing, then cut or grind the excess away to within a few thousandths of the line. Sometimes it is easier to form the lines with masking tape, as when preparing to shorten a slide or barrel, but whatever the method, don't try to work without guidelines.

Getting rid of excess in a projected dovetail, slot, or similar recess isn't quite as easy, and chisels and drills come in handy. For example, when cutting a sight dovetail, make closely spaced saw cuts inside the lines, then use a small chisel to cut out the sections left standing. When forming a sight tenon slot in a slide, drill closely spaced or overlapping holes inside the guidelines, then merely true up the slot with files. It's a lot faster that way, and much easier on both hands and temper. Remember, a file is a finishing tool, not one to be used for rough, heavy work.

Now, some simple filing jobs and instructions.

Truing up a front sight and squaring up the rear sight notch, front first, are first in line. Clean off all oil, dirt, and grease and clamp the barrel or slide firmly in a vise with protective jaws. Have the work just above waist height and solid. If it vibrates, the file will chatter and produce a rippled surface. If it shifts in mid-stroke, the file will skid and gouge.

To true up sight sides, hold handle in the right hand, tip of file in the left, then lay the file flat on the surface. Push forward a couple inches, keeping the file parallel to the surface, exerting just enough pressure so that you can feel the teeth bite. No need to lift the file on the return stroke, just ease up the pressure so that the teeth don't drag heavily.

A couple or three strokes, then take a look. Brush the teeth free of chips with the file card and repeat if the surface isn't trued up flat. Repeat on the other side, keeping the two sides parallel and true with the bore. You don't want the blade pointing off east or west.

Using the same file, held carefully perpendicular to the blade, use short strokes to square off the worn and rounded edges of the blade. Reshape the rear face if it suits your fancy at the time.

The rear notch can be your first inside filing job. Take the flat needle file, smooth the edge down (if one edge isn't flat, carefully grind the teeth off it), set it in the middle of the notch and file first to the left and then to the right with short, even strokes. Take care to keep the file vertical and parallel to the bore. This isn't as easy as it sounds since at first only the lower edges of the file will be cutting to square out the bottom of the "U".

Quit as soon as the "U" is squared out. Don't widen it further until you have checked it against the front sight width as discussed in the chapter on sights.

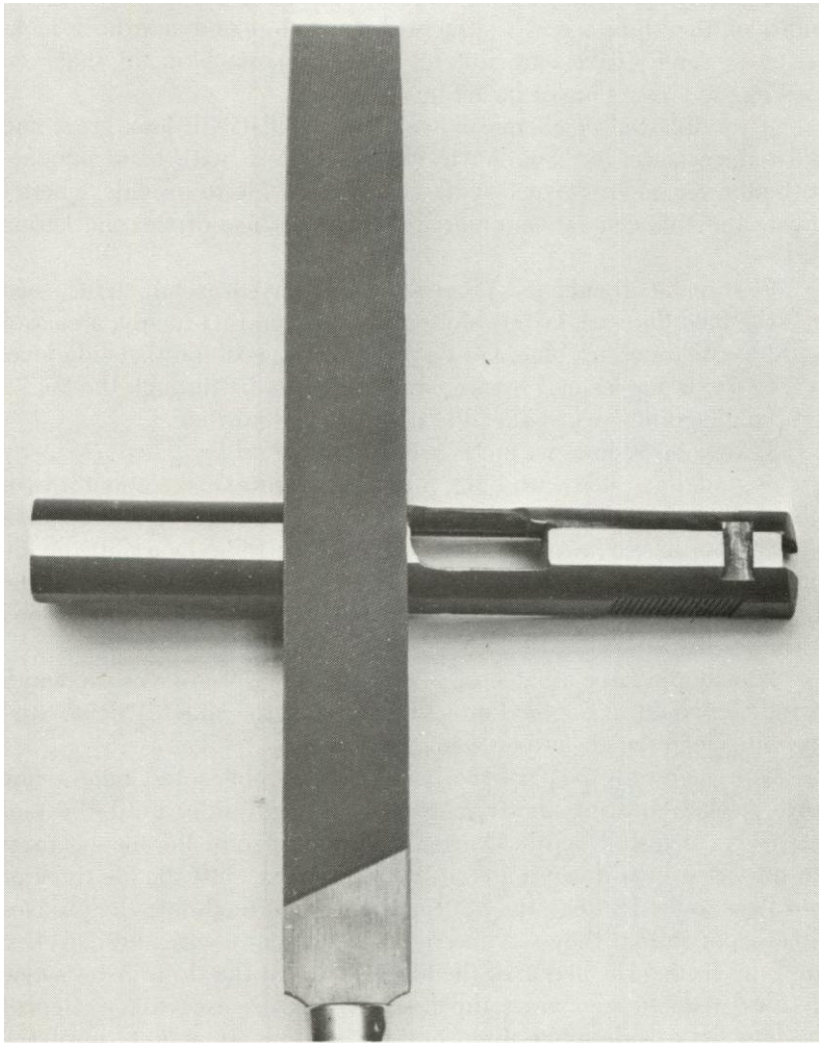
One of the most common filing jobs is cleaning up deformed screwhead slots. The screwhead file is designed for this and its toothed edges are knife-edged to allow working in thin slots. As with other jobs, the slot must be clean and the screw must be clamped solidly. Lead vise jaws or a slotted nut or tube allow clamping without spoiling the threads.

Place the file edge-down in the slot against the bottom, then tip it so the angled cutting surface is parallel to the screw body. Use short strokes to true up the wall of the slot. The slot is probably rather V- shaped, so initially the file will cut only at the lower edge. File only until the wall of the slot is clean and vertical. Then repeat on the other side, taking care to finish it parallel in both planes to the first side.

When the inside of the slot is clean and square, take a 6-inch bastard and make a few light strokes over the mouth of the slot, parallel with it, rocking the file gently to follow the curve or crown of the head if it is not flat. This will clean up the outer edges of the slot. Don't widen the slot excessively to accomplish this; that will weaken the head too much. Finish by polishing off any flats or burrs, and if the screw is heavily stressed, re-harden it.

A popular modification of autos when new sights are to be installed is filing a flat the full length of the top of the slide, as is found on the S&W M39 and M59 pistols. It isn't at all difficult to do, but does require some finesse.

Clamp the stripped slide level in the vise and remove the front sight. Get out your big striking file and chalk or talc. Clean and chalk the file and rotate the vise so you can pull or push the file, held at right angles in both hands, the full length of the slide. Hold the file as shown, using the thumbs to keep it at right angles to the slide and the fingers to hold it level. Pull or push the file the full length of the slide, keeping it centered and applying just enough pressure to make it cut cleanly. Don't lift it off the work on the return stroke, but ease off on the pressure so it slides back freely.



For draw-filing, a large flat file is held level and at right angles to the surface, then pushed or pulled with moderate pressure, just enough to make it cut smoothly.

After four or five strokes, clean and rechalk the file teeth, and check the progress of the flat. Check to see that it is developing square with the sides of the slide and that it is the same width from end to end. If one end is growing wider, ease off on it and bear down on the narrow end. If you're not certain about the flat's squareness, check with a machinist's square.

Continue, using full length strokes, cleaning and chalking frequently, until the flat is as wide as you like. No more than about 1/3 the width of the slide seems a practical maximum and narrower looks better to some. Take care not to remove so much metal that you weaken the locking lug or barrel bushing areas.

If sandblasted or chemically matted, this flat will look great and will reduce glare, but I prefer to either stipple it with hand punches or, better yet, to cross-cut it with a checkering file to provide a better effect, and this can be your initiation into the use of the checkering file.

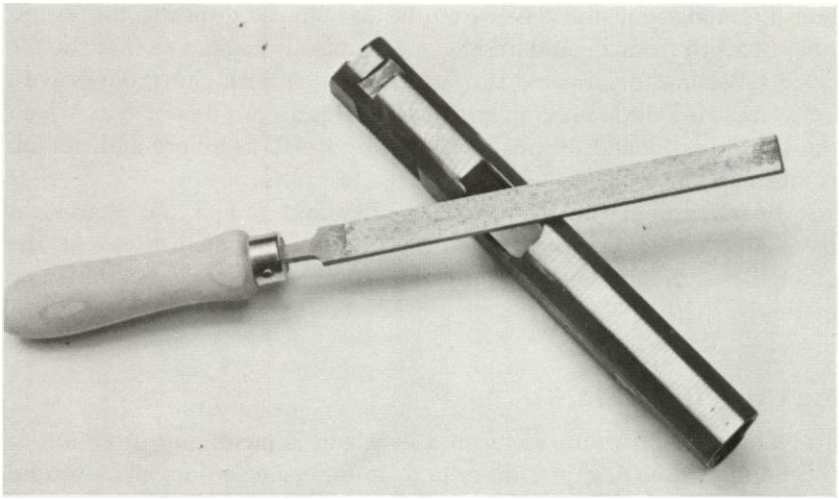
First make all cuts and provisions necessary to install sights, then coat the filed flat with layout blue. If layout blue isn't handy, a coat of cold-blue or touch-up blue will do just as well. Position the slide level in the vise. Using a small square, lay out and scribe through the blue a right-angle guideline just ahead of the rear sight position.

Take your 30-line-per-inch checkering file and lay its edge exactly on the guideline, then with light, uniform pressure, make about a two-inch stroke across the slide. Use just enough pressure to make the teeth bite and be sure to keep the file flat against the slide. Don't lift the file but carefully pull it back without letting the teeth slip out of the shallow grooves they've just cut. Take three or four strokes, then look at the results.

You should have a patch of shallow, parallel, V-grooves the width of the file, equal in depth from side to side of the slide. If depth isn't uniform, clean the file and even up the grooves.

Now, carefully put the file back in the grooves and take a few more strokes, bearing down more on the right side, until the end groove is cut to full depth. Don't lift the left edge of the file—it must cut too—just bear down more on the right. Next, shift the file three or four lines to the left, carefully fitting the rows of teeth into the grooves already cut so that they serve as a guide. Continue with short strokes, carefully feeling the action of the file so as to cut the three or four new grooves without deepening the first-cut grooves excessively. Repeat this process, overlapping three or four grooves at a time, until the entire area is covered. Check frequently with the square to keep the grooves at right angles to the sides of the slide.

You'll doubtless find the surface a bit uneven when you've finished, so now start over at the beginning—make one carefully aligned stroke, move left one groove, stroke, move one groove, stroke, etc. until you have completed this surface. This will level it and point up the between-groove's ridges sharply. Be sure to clean and chalk the file frequently to prevent gouging. Finish the grooved area by wire brushing with just enough pressure to remove burrs and feather the edges and to burnish the surface. Do most of the brushing parallel to the grooves to avoid blunting the ridges too much.



A simple, medium-spaced checkering file serves very well to serrate the top of a slide or any other surface where glare must be broken up or a more secure grip obtained. This well-chalked 30-lines-per-inch file produced the lateral serrations on this flattened ·45 auto slide in less than 20 minutes—and a commercial shop might charge upwards of $15 for such a job.

This same cross-grooving can be applied on the curved rear face of the slide to break up the glare, and also on the back and front straps to improve grip security. Curved surfaces require a good deal more care, for only a few lines of the file teeth can work at one time.

Begin by polishing, cleaning, and coating with blue. On an unworn gun, the original blue will serve instead of layout blue. Scribe a guideline near the center of the area if the curve is compound, at one end if it is straight, as on an auto front strap or flat mainspring housing. Align the file with the guideline and gently make a single, flat stroke which cuts only lightly into the high point of the curve. Don't try to follow the curve yet. Set the file over and repeat until you've cut short guide grooves on the high edge of the curve the full length of the area.

Now, using those grooves as guides, file carefully over the entire surface. Go lightly or you'll flatten the curve, and don't try to cut the grooves full depth—just get them well marked to form full-length guidelines.

Now obtain a two-line checkering file with the same spacing and use it to bring the guide grooves to full depth. If you can't find a two-line file, make one by very carefully and slowly grinding the excess rows of teeth from a standard checkering file. Take care so that the file doesn't become overheated during grinding. Finish the grooves with uniform, full-length, rocking strokes to clean up any minor flats which the big file produced. Burnish with a wire brash as before and the job is finished.

Rear faces of the front sight blades and ramps and rear sight bases and leaves should be given the same treatment to break up the glare. Being much smaller, they are more easily done by the same methods.

METAL CHECKERING

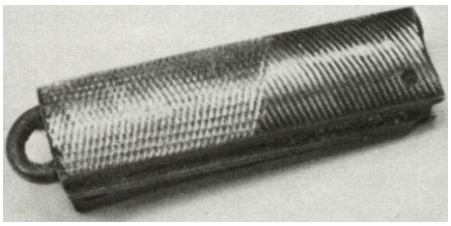
Checkering various areas on a handgun is merely an extension of the parallel grooving just described. It differs only in that a second series of grooves is cut at an angle across the first to form pointed, positive diamonds. Generally the two sets of grooves are crossed at 90 degrees, though you may use whatever angle produces the shape of diamond you like. Before laying out guidelines, make a few sketches with the aid of a protractor to decide what you prefer.

On a flat surface such as the slide example, file checkering must ran off the edges. On a curved surface, filing can be stopped short of the edges, but the grooves will taper out to nothing, leaving flat- topped diamonds near the edges, and these are not particularly attractive. So, for now, we'll assume that you'll ran the checkering off the edges.

Divide the crossing angle which you have chosen in half, and scribe a guideline at that angle to the edge of the piece near the center of the area. Scribe a second crossing guideline at the chosen angle to the first. Working exactly as before, cut the first set of lines to either right or left of the guideline to the end of the area to be checkered. Don't attempt yet to level this area as described earlier—that can come only after all grooves are cut. This leaves you with one set of grooves cut over about half the total area, with half the crossing guideline still visible. Switch to it and work to the opposite end of the area.

Now, pick up the existing grooves at the original starting points and work in the opposite direction to the end of the area, producing neat, pointed diamonds over all the surface.

If you can work completely to the end of the piece, the diamonds will be formed all the way, but if you must stop short of the end as on the upper portion of a back or front strap, you'll be left with an untouched open V in the center, flanked by two opposite triangles of parallel grooves. This is not unattractive, but to some it has an unfinished look. This can be corrected by carefully filing a one or two line border across the end of the blank V, then continuing the grooves with a short section of a two-lined file epoxied to a short handle.



First series of parallel lines has been cut lightly on this Gov't Model mainspring housing, then second series started to form diamonds.

The very ends of the grooves must be cleaned up and run into the border groove with a knife-edge needle file, handled very delicately. I don't recommend attempting this until you've checkered a few plain pieces for practice.

In any event, when all your diamonds are formed, go through the leveling process very lightly in both directions and finish by wire-brush burnishing. If you've patience enough and a steady hand, metal checkering can be done inside an incised border with the short two line file and knife-edge file.

FILING GRASPING GROOVES

When auto pistols are to be refinished, the grasping grooves at the rear of the slide are often in very poor shape. They've usually been battered, nicked, rusted, and bent to where they don't look right no matter how nice the new finish. Then, too, overzealous polishing often removes their sharp edges and thus much of their utility.

If there are only a few dents and burrs, simply cleaning up the edges with a needle file will suffice, but they're usually worse than that. To do the job right, wait until the rest of the slide is completely rough-polished. This will avoid spoiling your groove handiwork with a polishing bobble.

Scrub the grooves thoroughly clean, then select a three-corner file of convenient size and grind one side smooth and flat. Grind further until the angle between the smooth side and one toothed side match perfectly with the angle inside the grooves. Polish smooth and lightly tone off the wire edge where the smooth and toothed sides meet.

Clamp the slide solidly and level, one side up, then place the smooth side down into the front groove, toothed side against the vertical face of the groove. Take a few smooth strokes against the vertical face to smooth it up and take off all burrs and peened edges. Repeat in the next groove, and on through all grooves on that side of the slide.

Next, pivot the vise 180 degrees and turn the file so the smooth face is vertical, the toothed side down. Now, file the bottom of the grooves smooth and, if you like, deeper. Match the amount taken off both sides of the grooves so that a clean, sharp crest of uniform height is produced.

This method beats filing both sides of the grooves simultaneously by a country mile—using the undamaged bottom as a guide to clean up the vertical surface, then reversing their roles to keep the grooves straight and parallel with little effort.

After filing, I prefer to not polish the grooves. Their as-filed surface texture presents a pleasing complement to the fine polish on the rest of the slide. All they need is a modest wire brush burnishing to remove wire edges.

DRAW FILING OR STRIKING

Draw filing or striking isn't nearly as common in handgun work as with rifles and shotguns, but it does come in handy in work on flat surfaces or long, round, symmetrical barrels. It consists of laying a large, single-cut file across the surface at right angles to its long axis, then pushing or pulling the file the length of the part.

Striking files must be clean and sharp (and kept that way) and carefully controlled during the stroke. Striking is most useful in truing up flat or single-curved surfaces, to get rid of surface pits and roughness, and to remove coarse military finishes. The military Colt ·45 auto or the Browning HP slide makes a good example. Even when not pitted their surfaces can often be greatly improved in finish and trueness through draw-filing or striking.

As always, the part should be completely stripped, cleaned, and solidly clamped. First the rounded top.

Lay your 12-inch, single-cut file level across the top at right angles to the slide's length. Hold it securely in both hands, fingers ahead, thumbs behind. Bear down just enough to make the teeth bite, then pull or push the file smoothly the full length of the slide. Just one stroke, and look at the result. It should be a very narrow, bright, flat—the full length. Move the file a hair (half or less the width of that flat) to one side, tipping it just enough so that it remains tangent to the curve of the surface, and take another stroke. Continue this until all the original finish and/or pits are removed, and you're left with a clean, bare-metal surface composed of many, many narrow adjoining flats.

If there is a particularly bad spot that shows after all the rest of the surface is clean, don't try to work that area down separately. If you do, you'll just produce a low spot in the surface that will be glaringly evident later, and will defeat the entire purpose of draw filing. Instead, keep going back over the entire surface uniformly until all is clean and true. The many flats produced by draw filing are subsequently polished off as described in the chapter on refinishing.

Striking a flat area such as the side of a slide is done exactly the same way, except that the file is laid flat on the surface for every stroke. The process is continued until all imperfections and finish and waviness is removed to produce a truly flat and uniform surface.

When a flat surface is being struck, more attention must be paid to keeping the file clean and unclogged. The wider the area, the more likely the file is to clog, and if it becomes clogged the work surface may be deeply gouged. Then you'll have to file more to remove the gouges.

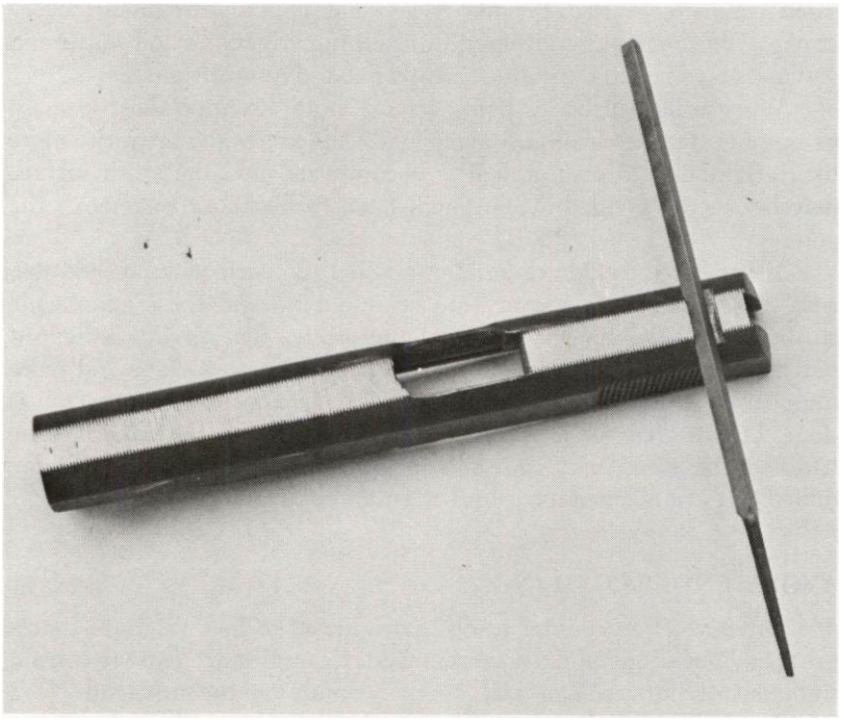
If you have trouble determining when the surface is finished flat, coat the surface with layout blue or cold blue and try a couple file strokes. If all the blue is removed uniformly, the job is finished. If patches remain, those areas are still below the main surface and more filing is necessary. When all the blue is removed, you know the job is done. Larger areas such as the sides of a big autoloader frame can be handled the same way, but file manipulation becomes a bit more difficult. It just takes practice and attention to detail.

AVOID ENDLESS FILING

Often you'll encounter a job that appears to be endless in that a great amount of metal must be removed. Examples are carving a front sight out of bar stock or making the cutouts on the underside of a ventilated rib. Actually, removing big chunks of metal is easier if you go about it right. We've already given the first rule: "don't try to take it all off with a file." Instead scribe all the outlines and use a good hacksaw. On the front sight, make parallel cuts down to form the sides of the blade, then horizontal cuts to free the excess metal. Cut fairly close to the lines and there won't be a great deal of filing to do.

On a vent rib where chunks of steel must be cut out rather than off, simply make closely spaced vertical saw cuts, then break or chisel out the narrow pieces that are left standing. After that, file the notch clean and true. If sawing isn't practical, drill a row(s) of small, nearly touching holes along the outline, then knock out the piece with a hammer and punch. This leaves more filing to be done than sawing does, but can still save an hour or two of work. And I'm a firm believer of long standing in doing onerous jobs the quickest and easiest way possible and practical.

A job that can be especially exasperating is hand-filing a new sight dovetail. Much the same can be said of widening or deepening an existing dovetail for a bigger sight. However, it doesn't really need to be all that bad if you'll prepare yourself a bit. First, get a special dovetail file from Brownell. It is smooth on the bottom, triangular in section and toothed on both upper surfaces to cut the correct angle when laid flat. Or, you can make one by grinding one side flat to the correct angle.



The dovetail file is a specialized tool. It has two smooth sides and one toothed side. A flat side is laid upon the bottom of the notch (or notch-to-be) and the toothed edge is worked one way to form the undercut on that side; then the file is turned around to cut the other side. Shown here cleaning up the rear-sight dovetail in a Colt GM slide that is being rehabilitated.

Then, to cut a new dovetail, scribe its top width and its depth on the part. Make close, vertical saw cuts inside the top lines and down to the base line, then knock out the narrow pieces. Take a narrow pillar file and dress the bottom of the notch smooth and properly level in both axes.

Now lay your dovetail file, smooth side down, in the notch and file first one side, then the other, undercutting the edges until final width is approached. Cut the edges parallel until just a hair under the final width, checking periodically against the sight base to be installed. Then open the slot up slightly on the right side until the sight will barely start.

From there, carefully open up the slot until the sight can be seated fully with light hammer taps and a soft drift. Final fitting may be easier if some filing is done on the sight rather than the slot—play it by ear.

Autoloaders are often found with badly battered, peened, or dented guide ribs and grooves which prevent free slide travel. Filing is the logical way to clean up these areas, and square and flat needle files fit the job.

The frame doesn't present any real problems since the grooves are exposed. Simply work the files inside the grooves carefully to knock off the high spots. Don't increase groove width, just take off rough spots. Needle file tangs will bend easily and this will help in getting the files into the grooves. Finish by lightly sliding a flat file over the outer surfaces to clean off burrs.

Slide grooves are different, being inside. Fortunately, they are less often damaged. I prefer to break off short pieces of the right size and shape files, then epoxy them to stiff wire handles bent to suit the job. A wood or tape handle on the wire is almost essential for good control. With this setup it's easy to get into grooves and recesses inside the slide. It also works down inside revolver and auto frames for removing burrs and cleaning up surfaces.

Other file jobs will come up, assuredly, but if you remember to choose the right file, keep the file and work clean, and clamp the work solidly, you'll be able to do them without too much trouble.

CHAPTER 4 - Metal Joining-Welding, Brazing and Soldering

You could probably work on handguns most of your life and be able to handle 99 percent of the jobs that came up without ever having to resort to welding or brazing, and only occasionally to soldering. That is, you could if you stuck with the regular "repair, replace, adjust" type jobs that are typical of modern cartridge handguns. On the other hand, if you get into the real oldies where parts are absolutely not available, or into muzzleloading antiques, or want to do some of the more exotic conversions and alterations, you'll need tools, knowledge, and skill for all three of those methods of joining metal.

Any form of heat-joining must be used with care on handguns. Barrels, cylinders, and breech faces are heavily stressed on firing, hence they are heat-treated during manufacture to suit the job, as are frames, particularly on revolvers. Any application of heat that spoils or deteriorates the original heat treatment can be dangerous. Consequently, we can't weld or silver-solder on a revolver cylinder or the chamber area of any barrel unless the part will be re-heat-treated afterwards to restore its strength. The same applies to big-bore autoloader slides and other heavily stressed areas.

Common sense is the best guide. We can safely silver-solder a front sight near the muzzle of a barrel or slide, but we don't do it over the chamber.

When it does become necessary to use high heat on a critical area, it must be re-heat-treated. On a small part, you may simply caseharden it, but other areas must be rehardened and drawn professionally.

When applying high heat to any part that must be kept smooth and free of scale, protective coatings should be used. When silver- soldering a sight to a barrel, coat the bore with Protek or bone black, available from Brownell's. Used according to directions, this material will keep the bore bright and spotless, but otherwise it will be roughened by the heat and surface oxidation. You may also apply Protek around the outer limits of a surface weld to reduce destruction of original finish by heat. This usually isn't worth the effort, since the outside of the part must be refinished after welding anyway.

When high heat is to be used, even if only soft-soldering, always remove all small parts to prevent damage. Even though you see only localized heat, it will travel surprisingly, and can ruin springs and the like several inches away. You can complete a weld on one end of a slide while holding it by the other, and if it is simply laid aside, a few minutes later the cool end will have absorbed much more heat, perhaps enough to ruin an extractor or spring. Be safe and remove all.

Many people without technical background knowledge or experience see welding and soldering operations performed frequently and yet never really realize what is happening. So, to start off, let's attempt to define in nontechnical terms each of those joining methods.

WELDING

This is the simple act of heating the surfaces to be joined (of similar metals) to the point where their surfaces are nearly liquid and then adding additional similar metal in the form of wire or rod which is melted by contact with the heat of the parts to be joined (not by the heat source or torch flame) and flows into and over the joint, fusing with the parts to form a thoroughly homogenous joint.

Note that in welding only the surfaces in contact along the joint line are actually liquefied and that the heat is kept localized as much as possible. Additionally, the filler metal (rod or wire) is melted not by the torch but by the heat of the parts being joined. Unless the joint area is hot enough to melt the filler rod, it will not flow into the joint and fuse with the parts being joined. Also, if the rod is melted chiefly by the torch, it will simply form a scab or overlay, adding nothing by way of strength to the joint.

The most common form of welding and the most useful to the pistolsmith is oxyacetylene (compressed oxygen and acetylene mixed inside the torch nozzle and burning in the proper proportions). It is usually known simply as "gas welding", though this term actually refers to all types and mixtures of gases which are used for specialized welding, as well as the more common oxyacetylene.

A properly-chosen oxyacetylene welding torch and tips will cut or weld any size part or stock you'll ever need for handgun work. Actually, the average torch available is more than you'll need, and I personally lean toward the miniature torches sold by the Brookstone Company. They are much more suitable for the small, precise work involved in pistolsmithing, due to their very light weight and small hoses. Their weight is only a fraction of that of the standard torches and hoses and are, therefore, much more easily used for close work. In addition, they still possess sufficient heat output and flame size for the typical general-purpose work you'll doubtless come up with once you have welding equipment.

An oxyacetylene welding rig does represent a fairly substantial investment ($100 to $150, for a complete outfit less tanks, and then the tanks may be rented where the gas is purchased). For this reason many part-time pistolsmiths are tempted to try and get by with the cheaper gas-air torches which can be had for around $50. This is normally a mistake, because such torches simply do not have the heat output, flame size, and intensity necessary for small, precise work. They can be great for brazing and soldering, but you'll never do first- class welding with them, no matter what their advertisements and brochures say.

There is one low-cost alternative with which quite satisfactory light welding (and that's all you need) can be done. This is the gas-oxygen torch which generates its own oxygen from sticks of a solid chemical compound burned in a sealed container to produce free oxygen. This oxygen is then combined in the torch with propane gas from a small cylinder to burn with a very hot flame. I have used it quite successfully on all manner of handgun work, to include welding together heavy autoloader slides and frames. The most well-known torch of this type is named "Solid-Ox" and is available for around $50, complete with all accessories, propane, oxygen sticks, lighter, and safety goggles. Quite similar equipment is available under other names, one of them Pyro-5, which I have also used with complete success.

The only objection to these gas-oxygen rigs is that they offer less flame control and provide only very low oxygen pressure which also cannot be controlled. A somewhat lesser objection is the relatively high cost of oxygen sticks compared to bottled oxygen. Depending upon the size of tip and oxygen stick used, up to about 12 minutes of operation can be obtained with a single filling. For occasional use and short jobs they'll do very nicely, but once you find out how handy welding can be, you'll eventually want a genuine oxyacetylene rig, in spite of its much greater cost.

BRAZING

This consists of joining two similar metals by heating their adjoining edges to a temperature which does not melt them, but which is high enough to melt a filler rod generally composed of brass and/or silver (and other ingredients in lesser quantity) to promote smooth flowing. In brazing, the molten filler rod or wire flows into the joint and penetrates the pores of the adjoining surfaces to a very slight depth. When solidified, it forms a very strong and secure joint. The important factor in brazing is that parts to be joined are not melted, but the filler rod is. Brazing generally takes place, depending upon the materials used, at between 800 and 1200 degrees Fahrenheit. The temperature spread is broad simply because the filler metal is chosen to melt a safe margin below the melting temperature of the metal being brazed—and those metals range from high-strength, alloy steels down to aluminum and bronze alloys with melting temperatures approaching 1000 degrees Fahrenheit.

A brazed joint obtains much of its strength from the closeness with which the parts are brought together. A joint containing an excessive thickness of filler metal will have only the unsupported strength of the filler metal, while if only a microscopically thin layer of filler results, much greater strength is obtained, a joint with strength well in excess of the filler itself.

There are actually two forms of brazing—that where the parts are fitted very closely and the molten filler is caused to flow into the joint by capillary attraction, thus forming a microscopically thin and very strong joint; and the type of job where a blob of brazing metal is laid over a surface primarily for the purpose of building it up rather than for holding two parts together.

Actually, brazing is seldom of any great value in pistolsmithing. Silver soldering is more useful, requires less heat and, at least in my opinion, is easier to handle. In reality, silver soldering should be called silver brazing, inasmuch as it differs from brass or copper brazing only in that less heat is required because the silver alloys melt at lower temperatures than the copper alloys. For this reason, we consider silver soldering a form of brazing and all of the foregoing applies to it. Because of the lower temperatures involved, it is much more useful to the pistolsmith. When properly done it offers all the strength required, and will also serve to build up worn surfaces just as well as brass or copper.

Copper brazing definitely requires oxyacetylene or gas-oxygen equipment, while silver soldering can be accomplished with an air-gas torch—or when the parts are large and massive, by using two air-gas torches.

SOLDERING

Also known as soft soldering to differentiate it from the silver soldering mentioned above, this soldering differs principally from brazing in that a lead-tin alloy is used as filler metal, much lower temperatures are involved and resultant joint strengths are substantially less. As a comparison, a practical maximum strength for soft solder is 4000 psi tensile strength while silver solder will run up to 14—15,000 psi, copper brazing even higher, and welding will match the strength of the original metals being joined.

Soldering is useful only where tightly fitted joints are involved. The process consists of coating the joint surfaces very thinly with solder (known as tinning) then clamping the parts together and applying only enough heat to liquefy the solder. The solder penetrates the joint surfaces very slightly, and contributes some strength to the joint.

Almost any form of heat will suffice for soldering, even the kitchen range or a charcoal fire, but by far the best combination for effectiveness and economy is the typical propane torch found in most households. If large heavy masses of metal are involved, more than one torch may be used. Better control and quicker heating of parts to soldering temperature is naturally obtained with a gas-air or oxyacetylene torch, and they are usually more convenient to use if you happen to have them.

Soldered joints are often reinforced with pins, screws, shoulders, offsets, or keys in the parts being joined. Parts subjected to high shear loads along the joint line can be successfully joined by soldering if the joint contains a key, offset, or mortise and tenon joint across the shear line. This will sometimes enable soft solders to be used where brazing or welding might otherwise be required for unreinforced joints.

FLUXES

Welding and brazing often require fluxes, depending upon the filler alloy being used and the metals being joined, while lead solders almost invariably require flux. To discuss fluxes here in detail might invite more arguments than could be ended. So it is sufficient to say that you should always know what alloy you are using for any of these processes, and then follow the manufacturer's recommendation for flux. It is generally specified on the label or in a product brochure. I think it is reasonable to assume that the fellow who is making the solder or filler rod should know what flux works best with his product. Do not, though, attempt to use flux with rod which does not require it, and vice versa. You'll not only find it frustrating, but you'll also produce a poor, weak joint.

SAFETY

Whether you are considering welding, brazing, or soldering, safety and cleanliness are of paramount importance—safety to protect your tender body, and cleanliness to insure the strongest possible joint.

Safety requirements are the greatest for welding, of course, and dictate that you wear dark "welder's" goggles or safety glasses, gloves (preferably leather gauntlets), long-sleeved shirt or jacket, and a canvas or leather apron. Welding goggles not only completely surround the eyes and prevent damage from any stray bits of molten metal that might be flying about, but their dark lenses prevent burning the retina, which is quite likely when one looks directly at the welding flame. The protective clothing prevents burns from molten metal. You might do the first several jobs without ever having a blob of molten metal or slag explode or spurt from the joint as a result of applying the torch tip too close, but eventually that will happen. When it does, it can blind an unprotected eye in an instant, or burn through ordinary clothing and cause serious injury.

No matter how short and simple the welding job, follow all safety precautions, and using a hat or hood to cover your hair is also an excellent idea unless you fancy scorched locks. Much to my discomfiture I once sported a very ragged looking beard for several days after a spark had jumped up and lodged in it.

Brazing and soldering also require the colored goggles if using an acetylene torch, and the gloves are essential to protect the hands. In this work there is less hazard from blobs of molten metal, however, so the other protective clothing isn't quite as necessary. Nevertheless, I recommend it.

PRELIMINARY CLEANING

Unless the entire joint surface is clean and free of rust or scale, you can't be certain of a solid, homogenous weld. Be sure to expose clean, bright metal all over the joint and the areas immediately adjacent to it. Grinding or filing are the most common methods where some stock removal is permissible. If, as in the case of a broken part where the break must be used to align pieces, no metal can be removed, then wire-brush heavily to remove rust and scale. Sometimes an acid etch of the joint surface will also help in obtaining a good weld.

Be sure to remove oil, grease, or other preservatives—not only from the joint, but from the rest of the part as well. Don't try to burn it off with the torch. That leaves residue. Instead, use a good solvent and do some vigorous brushing. A clean joint will save lots of trouble and be a stronger joint. Don't stint on cleaning.

WELDING PROCEDURES

Welding isn't something you can learn quickly by simply buying a rig, lighting the torch, and wading in untended. Not that it isn't possible to teach yourself that way, but you'll spend a lot less time and money—not to mention spoiled work—if you start with some professional instruction. Ideally, the best way is to take a course at a good vocational school. Many high schools also offer special night courses and there are state and locally-operated vocational schools all over the country which provide excellent instruction and shop practice on school owned equipment for less than what you might spend on lunchtime martinis.

If you elect this route, you'll be ahead of the game. However, there are alternatives—the best of which is to first obtain a couple of good books on welding and then enlist the assistance of a professional welder. Your library will have books, but you'll do well to purchase one such as the Audel Welders Guide, published by H. W. Sams & Co., 4300 W. 62nd St., Indianapolis, Indiana 46268. There are a number of other good books, both basic and advanced, and probably among the best are *Metals and How to Weld Them*, and *Oxyacetylene Welders Handbook*. Get them at your library or have the local bookseller order them.

If you're fortunate, you'll find a welder who is willing to spend a little time in actual instruction and practice work in exchange for a bit of help around the shop or some other favor you are in a position to render. If you can't obtain quite that much cooperation, though, you can probably obtain permission to stand aside and carefully watch what he does and ask for explanations of the processes. As a last resort, lacking the other sources, simply obtain your books and equipment and then charge ahead reading, practicing and learning on a plentiful supply of scrap metal. You'll save time and money for supplies if you stick with small jobs, and that is really all you will ever encounter in handgun work.

Let's assume, however, that you've learned the rudiments of welding, and now you want to apply your oxyacetylene skill to a typical handgun job. Probably the thickest metal you'll ever work on is when welding up the rear sight dovetail of a Colt Government Model autoloader in preparation for fitting some other form of sighting equipment. For this, choose a medium tip and adjust your oxygen and acetylene gauges accordingly. As for rod, 3·5% nickel steel rod (Brownell's can supply it) will meet every normal handgun job you encounter, and should be used here. This is one job where the thicker rod (3/32″ or ⅛″) can be used to good advantage.

Clean the surface thoroughly. Scrub the slide dovetail with solvent, then wire-brush it and the area immediately around it. A quick swish in solvent after wire brushing will float away any brush particles or grease which might have been rubbed off.

Since this is a filling weld, make sure you have plenty of rod handy, and clamp the slide in the vise. Light the torch and adjust it to a neutral flame and begin heating the entire dovetail area with a circular motion of the tip. Make certain you get plenty of heat down into the corners and you'll notice that in the process the sharp upper edges will begin to melt down. I prefer to go ahead and melt them down completely to the base of the dovetail to insure against leaving any gaps at that point.

Once the surface is liquefied, start feeding rod in, not too fast, while circling the tip to help distribute the molten metal. Don't try to fill the dovetail completely in one pass. Instead, lay an easily controlled layer the full length of the dovetail, then come back and lay another layer over it, and repeat if necessary until the entire area is built up at least 1/32″ above the balance of the slide. Pay particular attention to the outer edges of the dovetail to make certain you have a perfect bond so that no gaps, slag, or lines will show after the weld is dressed down.

If you've worked quickly, the rest of the slide will not have become too hot, so let it cool gradually in the open air. Of course, if you left any internal parts such as the firing pin and spring or extractor in place, the heat will have ruined them by now. If you question your ability to get the job done quickly, then pack the slide in wet asbestos from a point just in front of the dovetail before clamping it in the vise.

On your first job, don't put away the torch and rod right away. As soon as the slide is cool enough for handling, grind and file the weld down flush with the original slide surfaces and then polish with fine abrasive cloth to make any defects more visible. Examine the original outline of the dovetail very closely to make certain there are no gaps or slag. When the surface is polished, you should be able to see the outline of the welded area in a very vague change of color and sheen, but not in any other way. If you do find bits of slag or gaps at any point, dig out your Moto-Tool and grind the imperfection away to a depth of about 1/16th of an inch, then fire up your torch and very carefully fill the indentations with fresh weld. In any event, keep at it until you have a perfect surface after it is dressed down and polished.

At the opposite end of the scale, probably the smallest welding job you'll encounter is building up a Colt single-action trigger nose. This is another filling or build-up job, and one of a rather delicate nature. You'll want the smallest tip that came with your torch and the small 1/16 of an inch rod. Clean the upper limb of the trigger thoroughly with abrasive cloth so that nothing but bare, bright metal is visible, and clamp it upright in the vise.

Procedure at this point involves two schools of thought. One is that you simply bring the very tip of the nose to welding heat and add metal directly on top of that until the desired length is reached; the other is that you should move down a bit below the tip to where the trigger is much thicker and begin working from there, building up toward and on beyond the tip, thus beginning the job where there is more metal and therefore less chance of burning existing metal away before the job is started. I suppose the start-from-the-tip method is probably technically the best, but before you elect to go that route, try building up the very tip of a few pieces of 1/16″ or 3/32″ rod or wire. If you can do that without melting away the end of the sample piece, then you're ready to build up the trigger tip. Otherwise, begin down a ways and work carefully but quickly to avoid melting off original metal.

The key work in this job is to apply as little heat as possible to as small an area as possible while still having the rod flow smoothly. If you're afraid the job is getting away from you, switch off the torch, let the piece cool, and then start again, adding only a thin layer at a time. When doing this be sure to wire-brush the slag and scale off the previous work each time before starting.

When that's all done, file and grind the new metal down to shape, then polish it and examine it under a magnifying glass for flaws. If you find a flaw, you know you have to do the job over. The trigger nose is under very great stress and nothing less than perfection will do the job, even though you caseharden it well afterwards.

The last example we'll give of oxyacetylene welding on handguns is a joining job, and a most important one. Let's say you want to lengthen an autoloading pistol slide so as to install a custom target barrel of greater length—such as is often done with the Colt Government Model to produce what is known as a "Longslide Conversion".

To start, you have cut off the front of one slide just enough to eliminate the barrel bushing cut, and then cut a 1¼″ or so section off the front of another slide which will be joined to the first to give the desired length.

To prepare for welding you must first very carefully square up the joining surfaces so that the new muzzle section will align perfectly with the original slide. This requires that the two surfaces be very carefully filed or ground at right angles to the slide's centerline in two planes. Don't stint on this operation and think that you can correct it in the welding operation. Nothing less than perfect alignment will do. Now you must make a jig or clamp that will hold the two sections together snugly and in perfect alignment. I find that this can be done quite simply by welding two short (about 2″ long) sections of angle iron to a large C-clamp. One piece is welded to the base of the clamp, the other to the pad on the end of the screw. They should be kept reasonably parallel, though the ball-and-socket action of the pad on the screw makes them self aligning to a fair degree. Make certain the clamp is straight and the two angle irons are positioned so that a line drawn through the center of the screw and the base bisects the angles of both.

Hold the two sections of slide together and insert them between the angle irons and tighten the clamp snugly so the angles are centered on the top and bottom straight curves and thus automatically align the two parts. The slides may differ slightly dimensionally so that clamping isn't uniform on both parts, and if this is the case, you'll have to do a bit of file work until the clamp snugs them up in perfect alignment. Check with a straight edge to make sure that you're getting that alignment.

Now, fire up your torch and pre-heat both sides of the joint equally. This will require a lot of torch movement, but is essential if you are to avoid warpage in the completed job. When both sides are fairly close to approaching welding heat, switch to the center of one side and very quickly bring a small area to welding heat and apply the rod to tack-weld it about ⅛″ to ¼″. Don't waste time, fill the tack-weld quickly nearly up to the surface, then switch to the other side and make an identical weld. Let the weld cool, then check carefully to see that lateral alignment of the two parts has not changed. If alignment is a bit off, it can be corrected with a few taps of a lead hammer.

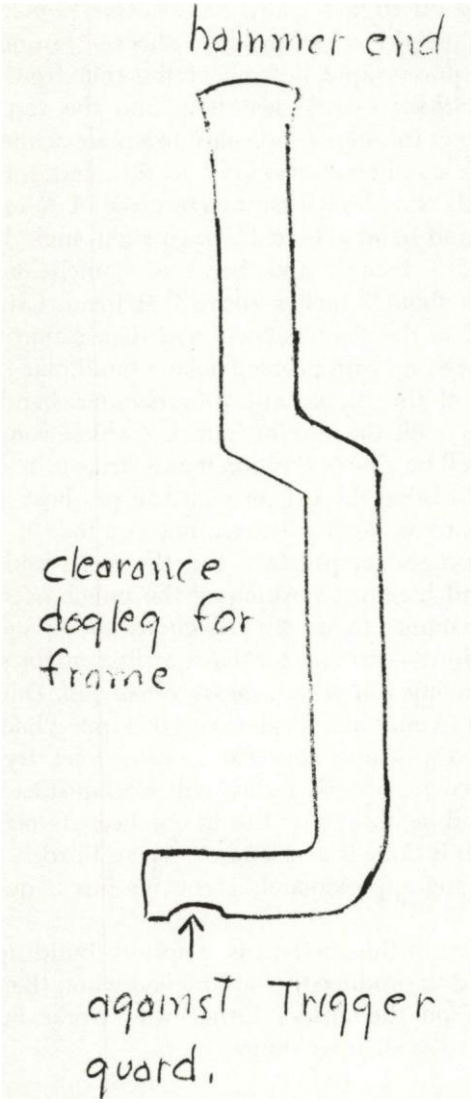
Clamp the slide back in the vise and tack-weld the top and bottom in the same fashion and then again check and correct alignment in the both vertical and lateral planes.

Once you have this done, it's a simple matter of filling in between the tack welds, making certain you have complete penetration to the inside of the slide and filling in the groove well above the slide surface. Pay particular attention to the edges of the weld and make sure that it extends past the original edges of the cut so there won't be any gaps or pits when the surface is dressed down flush.

This weld is subjected to a great deal of tension load, so the entire slide should be re-heat-treated before use. I have seen a couple such welded slides crack or stretch at the weld because this was not done. This type of heat-treating job is beyond the capabilities of the home shop unless you have an expensive heat-treating furnace and the knowledge to use it. It should be entrusted to one of the specialists.

Obtaining complete penetration of the weld will result in some protrusion inside the slide where it will doubtless interfere with proper functioning of barrel and recoil spring. If you're a glutton for punishment, you can remove this with round files and lots of sweat and patience. A much simpler method is to simply run drills or reamers into the upper and lower holes to cut the excess away. What little might be left in the slot connecting those two holes can then be removed fairly easily with flat files.

Those three jobs represent the complete spread of welding that might be required on a handgun. Joining up the sections of a shortened frame require exactly the same procedures as the slide-lengthening job described; filling any other recess will be about the same as the dovetail job; and any parts build-up job will be just like the trigger you did.



Bend or forge ½″ rod to this shape; cut groove in foot to fit inner edge of trigger guard.

There is one other pistolsmithing application of the oxyacetylene torch that may be encountered. It will be described here, even though it is not welding, per se.

The squared off trigger guard has become popular among aficionados of two-handed combat and field shooting, principally on autoloaders. This requires rapid heating of the thin front section of the trigger guard without excess heat flow into the rest of the frame, followed by prompt forging of the guard to square shape.

There are a number of ways to do this, but I have found the following to be the simplest. First, take a piece of ½-inch square steel stock, and heat and bend a 1- to 1½-inch right angle leg on one end. Move up about 3 inches, and bend a ½-inch dog leg in and cut the stock off about 3 inches above that bend. Grind and file the right angle bend to the shape shown, and then clamp the butt of the gun solidly in the vise (with protective jaws) and place a solid support under the front of the frame. Put your hammer handy and make a couple trial runs with the forging punch (which you just made) to make certain you'll be able to position it and strike it in a hurry.

Now, quickly bring the trigger guard to red heat, but be particularly cautious that you don't get it too hot and melt it. As soon as the guard is at the proper temperature, put the torch aside, quickly pick up the punch and hammer, positioning the punch as shown, and tap away with the hammer to stretch the guard out to square form. Use repeated light blows—striking too hard at first might simply tear the guard in two, leaving you with a messy repair job. Don't worry if the guard leans a bit to one side, it can easily be tapped back straight after you've obtained the shape you want. Also, don't try for a perfect square, sharp comer. A gentle radius will work just as well, and looks better. You should be able to do this in one heat if you're fast on your feet, but no harm is done if a second or even a third is required. Once you have the shape approximately right, it's just a question of filing and polishing.

An alternative to this method is simply to build up metal on the front of the guard to produce the outline you want, then grind and file away the excess on the inside. Either way works fine, but I lean toward forging rather than welding.

SILVER SOLDERING/BRAZING

As already said, copper brazing has little if any place in handgun work. Silver soldering or silver brazing is another matter entirely and is by far the best method of joining anything that does not actually require welding—and that covers almost everything except the jobs we've just discussed.

First, let's say you have a broken part. A Radom thumb safety with the shaft broken off, broken in two, just inboard of the thumb piece. Doubtless if you searched long enough among the gun cannibalizers you could probably find a serviceable Radom safety, but it would take time and money out of proportion to the effort required to repair the original by silver soldering.

Don't try to file or grind the surfaces of the break smooth. Leave them just as they are, for the irregularities present will help in alignment and add strength to the final joint. Clean both surfaces with a light etch of sulphuric acid and then rinse thoroughly. Scrub all the grease and dirt off of both parts first so that the final rinse does not drag it in to contaminate the joint. After etching and rinsing don't allow anything, especially your fingers, to touch the joint surfaces.

Clamp the thumb piece with the break up and apply the proper flux for the silver solder you'll be using. (At this point, I might suggest that Silvaloy or Markel #1175 are quite good for all your silver-soldering work.) Now, with a small tip and neutral flame carefully heat the break surface until the flux melts and develops a sirupy-look, and at that point apply the end of your silver-solder wire to the surface. It should melt and flow instantly like water. While it is still molten, flip off the excess with a soldering brush. You should be left with a microscopic thin, brassy/silvery coating on the joint's surface. Let that part set and cool while you do the same thing with the broken surface of the pin.

When both are cool, clamp the thumb piece upright as before, and carefully fit the two broken edges together, holding the pin with tweezers or needlenose pliers while resting your forearm and wrist on something solid so you'll be able to keep the part perfectly steady. Make sure the edges of the break are properly aligned—which you won't be able to do if you've allowed too much solder to remain on the surfaces—and then apply heat gently but quickly only to the break. Apply just enough heat so that the solder begins to flow and you can feel the broken pin begin to settle down into its proper position. You can give it just a little help, but don't press down hard. Its weight alone will squeeze excess silver out of the joint. Pull the torch away and in a matter of a very few seconds the solder will solidify and you can release the part very carefully to avoid disturbing the still soft joint. If alignment is off, re-heat and re-position the broken parts by eye. When the part is cool, scrape away any excess solder, and your Radom safety is as good as new.

This is the type of repair that really won't take you over five minutes, once you've developed a little torch dexterity. That five minutes and a few mils worth of gas and solder certainly beats shopping all over the country and paying a premium price for a salvaged replacement part of dubious parentage and serviceability.

Any other broken part, even a revolver hammer, can be repaired in exactly the same way with silver solder. If the job is done properly with a very thin joint line, the part will stand up to normal service just as well as the original.

A more common use of silver solder is to attach sights or ribs or, sometimes, a trigger shoe or grip-safety extension. Most important in all of these applications is the closest possible fitting of the parts and absolute cleanliness of the joint area.

A new front sight on any big-bore autoloader is an excellent example. As described elsewhere in this book, you have punched out or dressed down the old sight and have drilled and filed a slot in the top of the slide to accept the new sight tenon. With the new sight properly shaped, take the time with needle files and scrapers to carefully fit it to the slide so that the tenon is a perfect fit in the slot and the underside precisely matches the slide's top surface. Now, apply a commercial anti-flux around the joint area to prevent solder from adhering where its removal will spoil the finish, and to prevent flux from running out where it will destroy the original finish.

If the sight is a snug enough fit so that it will stand in proper alignment without assistance and without any excessive gaps, then it need not be clamped. Otherwise, modify a C-clamp or parallel-jaw machinist's clamp to hold it securely in place. Now, as with the Radom safety, apply flux to the joint areas on both parts, heat carefully, and flow on a thin layer of solder. It won't be necessary to use the solder brush inside the slot, but use it to wipe the excess off the other mating surfaces.

Now, fit your sight in its slot, tapping gently with a soft hammer if necessary (the slight buildup of solder may interfere with what was a free fit), and apply the clamp if necessary. If you don't happen to have a clamp, a few turns of soft iron wire will serve the same purpose if drawn up tight. Wire will, however, get in the way when you want to use the solder brush to clear away any molten excess. All that remains now is to apply heat until the silver solder flows freely, brush away the excess, and set aside to cool.

It is fairly common to see guns where new front sights have been silver-soldered in place and the original finish spoiled for a wide area around the joint. If the procedure just described is followed carefully, there is no reason whatsoever for spoiling the finish outside of the joint line. The first prerequisite for this is to scrape and clean only the joint surface where it will be covered when the two parts are mated, followed by very careful application of anti-flux right up to the joint. If you don't happen to have anti-flux available at the moment, a very soft lead pencil will serve the same purpose. Simply press the sight and slide together, and rub all the areas on the outside of the joint proper heavily with the pencil, depositing a thick coat of graphite, then blow the excess away and make certain you don't break the coating until after the solder has hardened. Deviate from the above procedure, and you will experience at least some loss of original finish from excess solder, flux, or carelessly applied heat.

You'll encounter other silver solder applications where it isn't practical, or at least isn't easy, to tin the joint area beforehand. When shortening S&W M39 and similar autos for combat conversions, I normally install the original or a replacement barrel bushing permanently and also make a new recoil spring guide bushing and install it likewise, both with silver solder. Tinning inside those holes is a miserable chore, so capillary attraction is depended upon for a good, fully filled joint, and it has never failed me yet.

In this, the mating surfaces of slide and bushings are first heavily cleaned with a rotating wire brush to remove the original finish and then etched in sulfuric acid. They are then thoroughly rinsed, coated with flux, and the bushings are inserted in the slide which is clamped muzzle up in the vise.

Normally, the inserted portion of each bushing is first dimpled with a prick punch or is squeezed slightly out of round so that it will be a friction fit in the slide, and therefore will not move around as heat is applied and the flux begins to bubble.

Heat is then applied around the periphery of the slide muzzle, not directly on the bushings, until the flux melts, and then 1/16″ Silvaloy wire is touched to the joint at about three equidistant points around the rim of each bushing. If the heat is correct, the solder melts instantly and is sucked into the joint to fill it completely. When cool, those bushings are there to stay and I have yet to have one come loose under the most severe firing tests.

The only disadvantage of the foregoing method is that since the silver solder is applied on the outside and allowed to flow into the joint, some deposit of silver is left upon the outer surfaces of the slide and bushings, even if anti-flux is applied as close as possible. I've never encountered any particular difficulty in removing this thin deposit with flexible stones and heavy wire brushing, but if this kind of work turns you off, it is only a little more difficult to apply the solder from the inside of the slide, thus avoiding any runover on the outside if the antiflux is applied thoroughly.

This requires only that the slide be clamped muzzle-down in such a manner that you can reach inside the slide to the inner end of both bushings with silver wire. Of course, it also requires that the bushings fit tightly enough so that they can't drop out, even as the slide expands from heat. With flux and anti-flux in place, simply bring the slide muzzle to the proper heat, then touch the silver wire to the junction of bushing and slide on the inside. The solder will be sucked into the joint and fill it completely, with the completed joint just as satisfactory as the one achieved by the first method described.

Silver solder is extremely useful in making replacement parts. Because of the beautiful job it does in bonding small, closely-fitted sections together, it allows building up a particularly complicated part from two or more sections of hand-shaped metal. By this process parts which normally require extensive machining to produce them in one piece can be duplicated by nothing more than filing, grinding, and silver-soldering. The basic processes are described in the chapter on parts fabrication, so will not be detailed here. It is sufficient to say that when parts are made in this fashion the joints must be fitted as closely as possible and that an absolutely perfect silver-solder joint must be produced.

SOFT SOLDERING/LEAD SOLDERING PROCEDURES

Soft soldering or lead soldering develops much less strength than silver solder, requires just as much care and attention to produce a good joint, and the only real advantage it can offer is that it may be accomplished with a heat source which won't do for silver-soldering. Though there are all manner of methods for applying solder—soldering guns, electric soldering irons, torch-heated irons, etc. —none of them are nearly as suitable for gun work as a carefully-controlled gas flame. With a little care and attention to detail, the common propane torch (I've long preferred the Bernz-O-Matic) is the most practical and economical heat source. Of course, a gas-air or oxyacetylene torch will do the job quicker because of its greater heat output, and if you have either you'll certainly want to use it.

Preparation of the parts and fitting of the joints, proceeds exactly as for silver-soldering. However, precise fit throughout the joint area is even more important because of the reduced strength of soft solder. In fitting front sights, butt caps, and the like (really the only places where soft-solder's strength is sufficient), I much prefer to smoke or apply Prussian blue to the joint and then very carefully scrape away the high spots until a perfect fit is obtained. As an old German gun smith once told me, "When you can squeeze damn near all the solder out of the joint, then it will hold."

Don't attempt to use a rosin-core or flux-core wire solder. Use solid wire or rod and the flux specified by its manufacturer for use on steel and iron. Many soft-solder fluxes are intended for use on brass, copper, and pewter, and do not give good results on steel. Apply your anti-flux or pencil lead, and very carefully tin the joint surfaces, brushing off the molten excess with a soldering brush.

With soft solder, don't depend upon the weight of the parts to bring them together. Always prepare some sort of clamping system which will put the joint under substantial pressure as the solder liquefies and thus force all the excess out of the joint and secure the thinnest possible joint line. I use cheap stamped-steel C-clamps with shaped blocks welded to their jaws for this purpose. If the tinned parts are placed together, aligned properly, and clamped tightly with this kind of clamp, there is enough spring inherent in the clamp design that it will squeeze the parts tightly together and force out the excess as the solder melts. Be sure to brush away the molten excess as quickly as it appears around the edges of the joint; don't give it time to solidify there.

If you've taken proper care, there's no reason for the original finish to be spoiled outside the joint. You can solder a ramp front sight on a like new handgun and never mar the original finish.

Normally, a very thin line of bright solder will show where the parts meet, whether you've used silver or lead solder. Solder-blackening chemical compounds are available from most gunsmithing supply houses, and can be applied with a wisp of cotton on the end of a toothpick to color this line. The exact color won't be a perfect match for the gun blue, but it will blend in so well that it is not noticeable except on most penetrating examination.

While soft solder is adequate for attaching sights, there are times when it alone should not be saddled with the entire job. This is particularly true of attaching a thin blade without any ramp to the ·45 and similar autoloaders, and when a new sight is being fitted to one of the Magnum revolvers having fierce recoil. In the former case, there isn't room to reinforce the joint with a screw, so it's a good idea to insert one or two 1/16″ drill-rod pins through the slide and sight tenon from the side. On revolvers, particularly with a ramp sight, there'll be room to use small screws turned down into the barrel. (More on this in the chapter devoted to sight installation.)

The best all-around soft solder for pistolsmithing is common 50-50 (half lead and half tin) sold in wire, rods, and bars. I've yet to find any particular need for bars larger than ¼-inch square, and normally 3/32 to 1/8-inch wire will handle 90 percent of the work. A few 3/16 or 1/4 inch rods might be handy, but I wouldn't spend any money on them unless a job comes up that can't be handled with wire.

There are other forms of solder and the type commonly known as "fusion solder" is becoming popular for many purposes. It consists of the solder alloy ground to a relatively fine powder and mixed with its proper flux into a thick paste. It is available both in lead and silver solder forms, and is applied in a thin layer directly to the prepared joint surfaces without prior tinning. Then, the parts are clamped together and heat is applied until the solder flows. Everything else in the process is the same. There are a number of applications where fusion solders offer advantages of speed and convenience over the other methods, and there is certainly no reason for not using them when that occurs.

Soldering fluxes come in all manner of formulas and forms. The common bottle of muriatic acid which hardware stores sell, is, in my opinion, an abomination. It's difficult to use, burns holes in your clothes, blisters your hands if you're careless, and spoils the finish on your gun unless you are unusually precise in its application. Other liquid fluxes fall in the same category, as far as I'm concerned. You'll find jelly-like fluxes in toothpaste-like tubes and I consider them nearly as inconvenient and messy as liquids. By far the best form of flux available is the paste type normally sold in a wide-mouth, screw-top jar. It's the right consistency for easy use when you obtain it, and while it will dry out over the months and years, it can be brought back to proper consistency by mixing in a few drops of water. The major convenience of paste fluxes is that they are easily applied in precise quantities, even in small and difficult-to-reach places. Use toothpicks, match sticks, or whittled wood splinters for small areas and whatever suits you for the larger spots.

EPOXY USES

Those heat processes covered are the traditional methods of joining metals and in most instances they are the best for handgun work. However, post-war technology has given us a number of metal- bonding adhesives which are quite useful for both temporary and permanent repairs or alterations. These are the two part epoxy mixes. Under certain conditions, they produce a joint of greater strength than soft solder.

Regardless of brand, they require that the joint surfaces be absolutely clean and very closely fitted. I use them frequently for attaching new front sights temporarily while the proper height and other dimensions are determined by test firing. Then, the sight is removed, finished and blued, and finally permanently installed with silver solder. However, I have seen a number of front sights fitted permanently to revolvers in this fashion, giving trouble-free service thereafter. Epoxy adhesives have reached such a high stage of development that some custom shops and manufacturers utilize them even for bonding ribs to shotgun barrels and for bonding liners into old barrels when relining. They're also sometimes used to correct excess headspace in shotguns and in other applications which you might not normally consider appropriate for chemical adhesives.

For good epoxy bonding all you need is the instructions that come with the package, perfectly clean and close-fitted joint surfaces, and the means to apply pressure to squeeze as much excess as possible out of the joint. In my experience the setting and curing time specified for most epoxy compounds is a bit short. I always let the joint cure for several days before use, regardless of what the label specifies. Of course, when epoxy is used for temporary repairs or alterations, there is the problem of removal. Actually, it's no great problem—simply whip out the trusty propane torch and apply heat gently and uniformly around the joint until a light tap with a soft hammer pops the joint. Most commonly-available epoxy compounds begin to lose strength above 300° F. and will usually break loose at around 400° with little difficulty. This is not enough heat to spoil bluing, though it might produce some deterioration of plated finishes.

Don’t underestimate the epoxy bonding agent. In an emergency it can pull many jobs out of the fire. I have even used them in stripped screw holes to form new threads into which a replacement screw can be turned. One such job on a S&W side plate screw has held now without difficulty for several years, and after firing many hundreds of rounds.

More recently we have the “Super Glues,” cyanoacrylate adhesive agents that set up in 60 seconds or less and have great strength. They are excellent for quick trial assembly or temporary repairs in low-stress areas.

CHAPTER 5 - Hardening and Tempering

Any piece of steel from which you might carve a part can be made harder, and also tougher. But make it too hard and it will break under load, and perhaps crack of its own accord while being hardened.

We aren’t talking here about extensive heat treatment of barrels, frames, slides, cylinders, and the like; but rather those relatively simple parts you might file and grind from drill rod or bar stock. Take an autoloader firing pin, for example. Already mentioned is how you can make one by simply filing a piece of round stock spun in an electric drill. If you make it from drill rod or tool steel (as you should) it will serve temporarily without further treatment, but hardened and drawn properly it should last the life of the gun. On the other hand, if you are forced to make it from common cold-rolled stock or scrap, it very definitely needs to be hardened. The same applies to an extractor, a heavily loaded pin, or any part subject to wear and impact.

For all this only the simplest of equipment is needed: A small heat source (your torch); a means of holding the part while quite hot; a small piece of 1/8-inch steel plate; fine abrasive cloth or paper; a container of light oil (petroleum base, not synthetic); and a can of water. And, of course, a place to work where the torch won’t set the house on fire. A sheet of asbestos laid over three or four bricks will do nicely.

FIRING PIN/SMALL PARTS

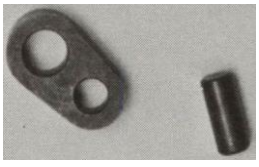
With everything laid out, let’s do a firing pin you may have made from drill rod. It must be hard enough to resist deformation when hit by the hammer, and tough enough that its thin nose won’t break under the impact of primer detonation.

Fire up the torch, then hold the pin in the flame, thickest part closest to the point of the flame, so it heats uniformly. Hold it with a length of wire wrapped around it rather than pliers which would draw off too much heat. Bring the pin quickly to a cherry red color, then plunge it immediately into the oil for a couple of seconds, then draw it out and hold it in the torch flame just long enough for the oil to burn off. This produces a hard but tough firing pin that will give good service.

An alternate and somewhat better method (if you have an electric bullet casting furnace) involves the use of molten lead for tempering or drawing after the initial quenching in oil. Melt the lead first, then set the heat control unit for 550-600 degrees F., and give the lead time (a half-hour or so) to stabilize at that temperature. Then heat and quench the firing pin and immerse it in the molten lead. Steel being lighter than lead, the part will not submerge of its own weight, so you’ll need a rod or wire attached to the pin in order to hold it under the lead surface. Leave the part submerged for 30 minutes, then remove and allow to air-cool. If any lead still clings to the part, scrape or polish it off when cold.

The lead bath is preferred over burning off the oil for firing pins, extractors, hammer noses, and other parts subjected to sharp impacts; it produces a much more uniform result and fewer internal stresses than simple torch application.

It may be that a firing pin or other part is too small to hold and heat uniformly by itself. In that case, wire the part to a small piece of 1/8-inch steel, then heat the plate from the opposite side until the part reaches the right color. Then quench and temper the two together for best results. The plate will insure the small part’s uniform heating, hardening and tempering.



Small, highly-stressed parts such as this barrel link and pin must always be heat-treated for strength and durability.

LARGER PARTS—CONTROL BY COLOR

Larger parts can be treated differently, but they must be large enough to hold their heat so you can see the color of the steel change as it cools. For this method, the part is heated as before, then quenched in clean, room temperature water. Withdrawn from the water, one side of the part is quickly given a swipe with steel wool or abrasive cloth to clean it, and the changes in color that it passes through (as it cools) are watched—and when the correct color is reached, the part is again plunged into the water and left to cool.

There are many color variations, all closely associated with a particular temperature range, but we'll list here only those suitable for typical pistolsmithing work.

1) Blue (full blue, not the blackish blue of higher temperatures), about 560 degrees; for firing pins, cutting tools, and the like.

2) Dark purple, about 550 degrees; for chisels and punches, hammers and triggers.

3) Light purple, about 530 degrees; for cutting edges of knives.

4) Brown and purple, about 510 degrees; for wood working tools, welded-up sear notches and sear noses, hammers, trigger noses, etc.

5) Yellowish brown, about 490 degrees; for dies and swages.

6) Full straw, about 470 degrees; for hand noses, bolts, rubbing surfaces on rebound slides and levers.

7) Pale straw, about 450 degrees; for hammer faces, firing pin heads, striking surfaces, etc.

8) Faint yellow, about 430 degrees; very hard, too hard for thin parts. Useful only on thick parts under heavy rubbing load.

As the appropriate color appears on the part—and on clean steel —the changes can be seen clearly, running from one into the other as the part cools, the part being plunged into water to cool. The smaller the part, the faster it will cool, and all the colors may not be seen, thus this method is unsuitable for many handgun parts.

As pointed out elsewhere, you should know what steel you are using. For drill rod and alloy (tool) steels, use oil as the quenching medium; for plain carbon steels, use water. Hardening will be produced in either case, but the correct quench produces the best and most uniform result.

Don't expect a perfect job on your first attempts at hardening and tempering. It takes a good bit of practice. If you've just made or repaired a part at considerable effort and haven't yet done any hardening, don't gamble the part on your first attempt. Instead, cut some similar size scraps of the same steel and practice with them first. Once you're convinced you understand what you've done with the scraps, and they show evidence of the hardening you need, then have a go at hardening and tempering the part.

CASE-HARDENING

Casehardening is a very convenient form of hardening hammer notches and sears whose original thin hard surface has been removed by stoning or grinding or just plain wear. It produces a very hard thin skin on the part while leaving the interior relatively tough and tenacious. It is well suited to points where wear resistance is more important than brute strength.

The traditional method of case-hardening can easily be used on small handgun parts, though it is more trouble than the newer procedures. For the old method, obtain some bone meal from a fertilizer store, then get a piece of pipe big enough to easily hold the part to be case-hardened. Cap one end of the pipe, then pack the part solidly in bone meal inside it. Center the part in the bone meal as much as possible. Plug or cap the other end of the pipe. Now, heat the entire pipe cherry red and keep it there for about an hour. A torch isn't adequate for this, but a good hot charcoal fire boosted by the blast from a vacuum cleaner will do the job. When the hour is up, quickly open the pipe, and dump the contents into water.

When cool, the part is case-hardened. It has absorbed carbon from the bone meal to form a thin, very hard, wear-resistant skin on its surface. This hard skin also resists rust well.

The simpler method of case-hardening is done with the torch and a special hardening compound sold by Brownell's and other suppliers. Several compounds are available, but the one I've used with good success is named Casenit.

One simply heats the part red, then dips it into the Casenit powder, then reheats until the compound melts and burns. Several applications may be necessary to produce the depth of hardness required, but the process is so simple anyone can succeed merely by following the instructions on the label.

Casenit and similar compounds are very easy to use and perform very well for rehardening trigger noses, sear noses, hammer notches, and the like. However, they aren't practical for entire large parts such as hammers and frames. In the instance of a complete hammer, the notches should be case-hardened first, then the entire hammer hardened and tempered as described earlier in this chapter.

Hardening and tempering aren't difficult, but unless you devote some time and effort to practice, you may well ruin parts on which a great deal of time has already been spent. I'd encourage you to practice a fair amount with junk parts or steel scraps of comparable size before jumping off the deep end for the first time with a rebuilt SAA Colt hammer.

CHAPTER 6 - How They Work

Obviously, it would be an exercise in frustration to attempt to repair any mechanism with which one was not already reasonably familiar. Cartridge handguns are relatively simple mechanisms, but they have been uniquely developed toward a very specialized function which is not at all difficult to understand. Revolvers, for example, whether of single-action or double-action persuasion, are made up of nothing more or less than a series of levers, most of them spring-loaded, and all of them relating in function to the trigger and/or hammer. In other words, all movements and actions are initiated by manual movement of either the hammer or the trigger. Assorted levers then rock or pivot to perform or cause the actions which result in alignment of the cylinder with the barrel and the firing of a cartridge. Autoloading pistols bring in a few new actions, though their actual firing mechanism is for all practical purposes quite similar to that of a single-action revolver. They simply add reciprocating (sliding) parts which serve to feed fresh cartridges into the chamber and extract and eject fired cartridge cases.

Basic modern handgun types are shown above: left, Ruger Blackhawk single-action revolver; S&W double-action, swing-out cylinder revolver; S&W locked- breech, double-action autoloader; Colt M1911 locked-breech, single-action autoloader.

The point I'm trying to make is that while handguns may be sophisticated in design these days, their functioning—the various movements of their parts—is quite easily understood if one will simply look at them closely and follow their movements. In reality, anyone who can understand the functioning of a pair of common scissors or a carpenter's brace can understand handgun functioning equally well with just a bit more study.

While we'll attempt to cover this subject in detail in the following pages, the assimilation of that information will be less painful if you can have before you as study references two or three typical handguns. Ideally, this would include a Colt single-action Army or one of the many copies thereof (single-action revolver), a modern Colt or S&W doubleaction revolver, a locked-breech autoloader such as the Colt Government Model or the S&W M 39, and a double-action, unlocked-breech pistol such as the Walther PP or PPK. If you are gun buff enough to want to learn how to repair and modify handguns in general, then you probably already have those or similar models at hand. If you don't, surely you have one or two, and it's a fair bet that you have friends who can make them available, quite possibly in return for use of this book themselves. Anyway, let's get into the inner workings of handguns— the single-action revolver first.

FUNCTIONING—COLT SA ARMY

The oldest of all our practical handgun designs are unique in that all American and many foreign makes and models have remained unchanged in principle and have changed only slightly in detail since Samuel Colt's first "revolving repeating pistols" were manufactured in 1836 for percussion ignition, and loose powder and ball. The singleaction is also noted for having the fewest parts of all repeating handgun types.

The SA consists of a hollow, metal rectangle, constituting its frame, with a moveable cylinder (containing the cartridge chambers) held in the opening by means of a pin passing through both cylinder and frame. At the upper front of the rectangle the barrel is screwed in place, and at the lower rear recesses are cut to house the parts necessary for its operation—parts which are generally known collectively as the "lockwork."

The parts which control the movement of the cylinder and which provide for firing the cartridge are as follows: Hammer, containing the firing pin, and the mainspring, which drives the hammer rapidly forward at the proper time; the hand or pawl with its spring, which rotates the cylinder for each shot; the bolt (cylinder stop), which locks the cylinder in alignment with the barrel for firing (and unlocks it for rotation) with its spring; and the trigger, which serves only to hold the hammer at full cock and allow firing when desired, of course, with its spring.

Each of these parts is held in the frame behind the cylinder by lateral pins or screws, and in operation each of these parts rotates about that pin—with the single exception of the hand which is pinned to the lower portion of the hammer and rotates thereon.

Let's assume we have a Colt SAA, loaded, hammer down on an empty chamber.

Functioning begins when you hook your thumb over the hammer spur and pull rearward, rotating the hammer about its screw. As the top of the hammer moves rearward and down, the hammer foot rotates forward and up, carrying with it the hand which is pinned to the hammer. At the same time, as the hammer starts rotating, the stud or cam on the foot of the hammer engages the rear limb (extension) of the bolt, lifting it and thereby pivoting the bolt around its pin, lowering the bolt proper out of the locking cut in the cylinder.

At this point the hand, which is also moving upward propelled by the hammer—contacts the ratchet at the rear of the cylinder—and begins to rotate the cylinder clockwise. As the hammer continues its rearward rotation, the hand continues to rotate the cylinder, and the stud on the hammer foot lifts the rear of the bolt as far as it will go, then the spring action and shape of the limb causes it to snap over and allow the cam to pass it as hammer rotation continues. At this point, the bolt spring asserts itself and forces the front end of the bolt upward to engage the lock notch in the cylinder as cylinder rotation stops.

As the hammer continues to rotate, the hand moves through its full travel and by exerting pressure on the ratchet rotates the cylinder 1/6 revolution, roughly aligning the next chamber with the barrel. As the cylinder reaches its final position, the bolt snaps into the locking cut, leaving the cylinder held rigidly in alignment with the bore. Just a slight bit more hammer rotation past this point causes the nose of the trigger, under the influence of the trigger spring, (which is simply a separate limb of the bolt spring) to snap into place in the full-cock notch. The hammer should be released at this point and the trigger will hold it in the full-cocked position.

During the hammer's rotation the trigger nose has slipped past first, the safety notch, and second, the halfcock notch or loading notch. Had the hammer been stopped at either of those points, the trigger nose would have snapped into position and held the hammer there. Since both of those notches are undercut and when engaged overlap the trigger nose, reasonable pressure on the trigger cannot cause the hammer to fall and fire the gun.

With the gun cocked as we left it above, pressure on the finger piece of the trigger rotates it about its screw, moving the trigger nose out of the full-cock notch. This leaves the hammer free to be driven forward by its mainspring, rotating about its screw, with its firing pin striking through the frame to fire the cartridge in the chamber. During its downward rotation, the cam on the foot of the hammer strikes the bolt limb, but the bevel on the underside of the cam simply forces the spring-tempered limb aside so that it does not interfere with full hammer travel. Coincidentally, this downward force on the bolt limb exerts upward pressure on the front of the bolt where it engages the cylinder at the instant of firing. When the hammer's downward fall is halted by the hammer face striking the frame, the entire lockwork is back in the position from which we started.

All of the foregoing may be more easily visualized and better understood if you will simply take an SAA Colt frame and use a long punch to mark the hole locations of the hammer, trigger, and bolt screws on a smooth piece of hardwood or plywood. Then drill proper diameter holes at those points, and press in hardwood dowels of the same diameter as the screws. Follow this by dropping the respective parts over those pins (dowels) and then position the parts as they are in the gun. You can then move all of the parts through their normal functional cycle and observe exactly how they function.

Later, when performing actual repairs on this gun, you will find it advisable to make up a steel block with properly-spaced hammer, trigger, and bolt pins seated in it. Then, the parts may be put over the pins, to check repairs before returning the parts to the gun.

Functioning of the balance of the SAA is readily apparent by visual examination. For example, the mainspring is held tightly to the trigger guard strap at its base by a screw; the hand is held in proper alignment in its groove by a slender flat spring which is assembled permanently to the hand and bears against the rear edge of the frame groove in which it rides. The bolt spring is simply held in place by a single screw underneath the trigger guard. The cylinder rotates upon a removable base pin, but a bushing is seated in the cylinder which contacts the base pin directly. The front end of this bushing serves to position the cylinder fore and aft, thus regulating headspace and barrel/cylinder gap. The ejector rod is nothing but a simple spring- loaded plunger, and the loading gate is held shut or open by a simple spring-loaded, ball detent. And, of course, unique to the Colt SAA design, the grip frame and trigger guard is formed of a backstrap and a front strap or trigger guard, held to the frame by five different screws, and joined at the bottom front of the butt by a single screw.

The only remaining, unseen mechanical feature of this design is a separate firing pin bushing pressed tightly into the front of the recoil shield, aligned with the barrel/chamber, and bored out from the rear to allow the firing pin to protrude through it the proper amount to fire a cartridge.

When the SAA hammer is drawn back to the safety notch and allowed to remain there, the trigger nose prevents the firing pin from reaching a cartridge, and the hammer has not traveled far enough yet to disengage the bolt, so the cylinder remains locked. This was originally intended to allow safe carrying of the gun with all chambers loaded, but the design is fragile, and experience has taught us not to rely upon it. Thus, it is common practice to leave the chamber under the hammer empty or to lower the hammer so that the firing-pin tip fits between two case rims and thus prevents the cylinder from rotating.

The second, half-cock or loading notch provides a safe hammer position after the bolt has been retracted to free the cylinder for loading. With the hammer engaged at the position, the bolt is held disengaged, the cylinder may be rotated freely, and the loading gate opened to allow empties to be punched out and fresh cartridges to be loaded.

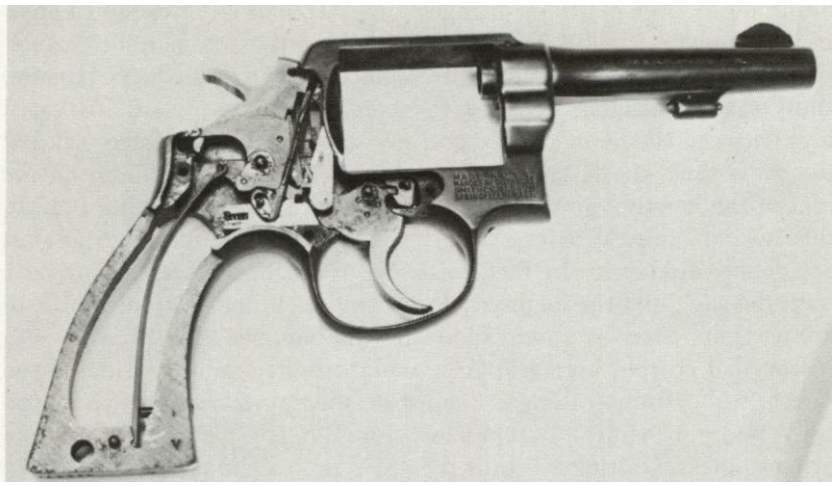
Though modern SA revolvers such as the Ruger (Pre-'73 model) have been improved in detail by coil springs and slightly different parts shapes and firing pins, they still function essentially in the same manner.

DOUBLE-ACTION REVOLVER FUNCTIONING

DA revolvers accomplish the same functions as the SA when manually thumb-cocked, but in a slightly different manner. In addition, they must provide for what is essentially trigger-cocking functioning wherein long rearward movement of the trigger both cocks and drops the hammer and rotates and locks the cylinder. The term "trigger-cocking" is probably more apt than "double-action," and in the beginning such designs were described as "trigger-cocking."

Since there are more variations between different designs, our descriptions of double-action revolver functioning cannot be quite so precise. We'll actually describe two basic types—the older type on which the hammer strikes the primer directly through either an attached firing pin or a separate firing pin contained within the frame; and, the more modern type, which utilizes a transfer bar against which the hammer strikes and thus transfers its impact to a separate firing pin housed within the frame. Theoretically, the latter is the safer of the two against accidental discharge, though the earlier designs accomplished much the same thing through a rebounding hammer.

The older type first, using the Smith & Wesson M10 (Military and Police model) as an example. With the hammer down in rebound position and the gun loaded, single-action (thumb-cocking) functioning proceeds as follows: rotating the hammer rearward causes the toe of the hammer to rotate forward and upward, lifting the trigger tip or nose and thus rotating the trigger about its pin. This causes the front lip of the trigger to press downward on a shelf on the underside of the bolt and thus rotate the bolt out of engagement with the cylinder. At the same time, continued hammer rotation carries the trigger up, carrying with it the hand which engages the ratchet at the rear of the cylinder and begins cylinder rotation. As the hammer continues on back very slightly to the point where the toe of the hammer containing the full-cock notch, bridges with the precisely shaped nose of the trigger, the two mate to hold the hammer at full-cock, and the trigger in its rearmost position. During hammer travel the mainspring was bowed, storing up energy to later drive the hammer forward, and the trigger forces the rebound slide rearward, compressing its spring. During rebound slide travel, a pin on its surface engaged in a slot in the hammer block draws the hammer block downward, removing it from the hammer's path.

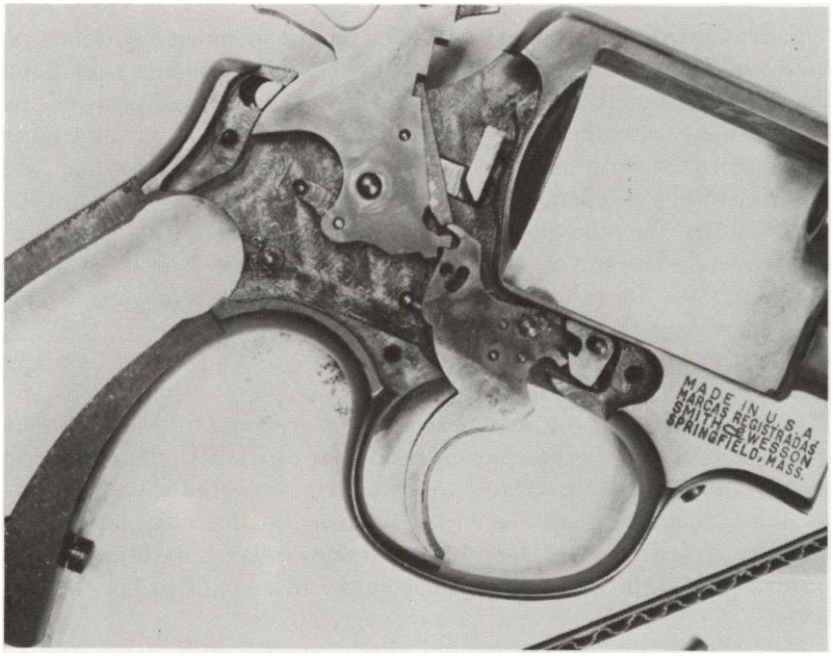


The complete S&W lockwork at rest, just as it appears when the side plate is lifted off.

At this point, the gun is ready to be fired single-action by slight rearward movement of the trigger.

Pulling the trigger rearward lifts its nose out of the full-cock notch, and allows the hammer to be driven forward by its spring. So long as the trigger remains fully rearward, the rebound slide holds the hammer block down and out of the hammer's path, consequently, the hammer strikes the rear face of the frame, causing its firing pin to protrude through the recoil shield a sufficient amount to fire the cartridge.

At the instant the shot is fired, the hammer is fully down, resting against the rear of the frame, and the trigger is still fully to the rear, forcing the rebound slide to the rear. Then the trigger is released, the rebound slide spring drives the slide forward, also the trigger, and the hump on its upper surface engages a corresponding hump on the foot of the hammer, forcing it forward, thus the top of the hammer rotates rearward, retracting the firing pin from the recoil shield. As rebound slide travel continues, it forces the hammer block upward so that it lays between the hammer face and the rear face of the frame—and at the same time, the hump on the slide moves under the hump on the foot of the hammer and blocks the hammer rigidly in that position. In this fashion, release of the trigger makes the gun fully safe against accidental discharge. In fact, with the rebound slide fully forward, both the slide and the hammer block combine to make it impossible to fire the gun, even by strong blows on the hammer spur. It is for this reason that current vintage DA revolvers are generally considered the safest of all handgun designs against accidental discharge. It is physically and mechanically impossible for the hammer to detonate a primer unless the trigger is pulled fully to the rear to remove the safety block and the rebound slide from the hammer's path.



As DA functioning begins, rearward movement of the trigger raises the trigger nose against the underside of the DA fly on the hammer, beginning rearward hammer rotation; and as rotation continues, the shelf on the trigger beneath the nose contacts the underside of the hammer foot and continues to rotate the hammer.

From this position, with the trigger forward, the hammer in rebound position, and an empty fired cartridge under the hammer, we can begin the double-action functioning cycle.

Initial movement rearward of the trigger rotates the front lip downward and draws the bolt out of the locking cut in the cylinder. As the trigger rotates, the hand is pushed upward to begin cylinder rotation, and the nose of the trigger bears against the underside of the double-action fly on the hammer and begins rearward rotation of the hammer. At the same time, the trigger is forcing the rebound slide rearward, compressing its spring, and drawing the hammer block downward. These actions all continue simultaneously, and soon the point is reached where the bolt pops forward on its elongated hole and disengages from the trigger lip and snaps back up against the cylinder. Cylinder and hammer rotation continue and eventually the hand has rotated the cylinder through 1/6 revolution at which point the bolt snaps into the locking cut, and with continued trigger movement, the trigger nose slips out from under the DA fly, and the mainspring drives the hammer forward to fire the cartridge.

The trigger must remain rearward until the hammer completes its fall, or, as before, the rebound slide will move forward and raise the hammer block to intercept the hammer and prevent firing. Thus, if one's finger slips off the trigger at the instant the hammer starts to fall, the hammer block would move up to intercept the hammer and prevent firing.

After the hammer falls, and the cartridge fires, releasing the trigger allows the rebound slide to move it forward, retract the hammer, and re-engage the hammer block, leaving the gun ready for a subsequent shot in either single or double-action mode.

Different from SA revolvers, most modern DA revolvers have a separate side plate attached to the frame by several screws. This plate may be removed to permit observing the functioning of the various parts throughout the firing cycle in either model. So, if you have a S&W DA revolver, simply remove the grips and the side plate and then observe the movements of the parts as you read through the foregoing description. This will aid materially in understanding what goes on and even more so in determining when something is amiss.

Not only is the lockwork of a DA revolver more sophisticated and composed of more parts than the typical SA, but the balance of the gun is a more complicated design. The cylinder is carried upon a U-shaped member, commonly called a crane or yoke, whose lower member enters the frame from the front and pivots there, while the upper member fits into the center of the cylinder and provides its axis. The connecting part of this horizontal "U" fits closely in the front of the frame and is contoured to match it. The crane rotates roughly 90 degrees to open and close the gun, thus exposing the rear of the chambers for extraction and reloading. It is locked in firing position by a spring loaded plunger inside the centerpin or extraction rod which protrudes through the cylinder ratchet into a hole in the recoil shield.

Further, in S&W designs a second spring loaded plunger located beneath the barrel snaps into a hole in the front end of this rod. When these two plungers are properly engaged, forward pressure on a thumb piece (latch) on the left side of the frame forces a short rod against the rear plunger, forcing it out of its seat in the frame, and simultaneously its front end forces the barrel locking plunger out of its seat in the end of the extractor rod. At this point the cylinder/crane unit is free to be swung to the left to open the gun. Then, the extractor rod, attached inside the cylinder to the ratchet/extractor star, is pushed rearward, and it forces the fired cases out of the chambers by pressure on the underside of their rims.

When extraction/ejection is complete, and the rod is released, an internal spring snaps it back into its original position. The gun may then be reloaded by placing individual cartridges in the chambers, and the cylinder/crane unit closed to its locked position, making the gun ready for subsequent firing.

While the cylinder is open, the thumb latch is forced forward by its internal spring, and in so doing moves a shoulder underneath the tail of the hammer which prevents the hammer from being rotated toward the cocked position. This is deemed a safety feature inasmuch as it prevents having the hammer inadvertently cocked when the gun is closed with loaded chambers. Theoretically, the impact of vigorous closing might jar the hammer off the full-cock notch and result in an inadvertent firing—thus the block, which prevents cocking while the gun is open, and also prevents opening while cocked.

In addition, there is a small lug protruding at the lower left rear comer of the cylinder recess in the frame and this engages the rear periphery of the cylinder to hold it in the same relative position upon the crane as when it is open.

Unlike SA revolvers with their removable cylinder bushings which establish headspace and barrel/cylinder gap, the S&W cylinder is fitted with an integral forward extension which is called a gas ring, but which bears against the rear face of the crane and establishes the cylinder's position within the frame opening.

Other modern double-action revolvers perform all the functions just mentioned—in both modes—but with the exceptions of those foreign guns of the S&W design, they accomplish the movements with slightly different parts.

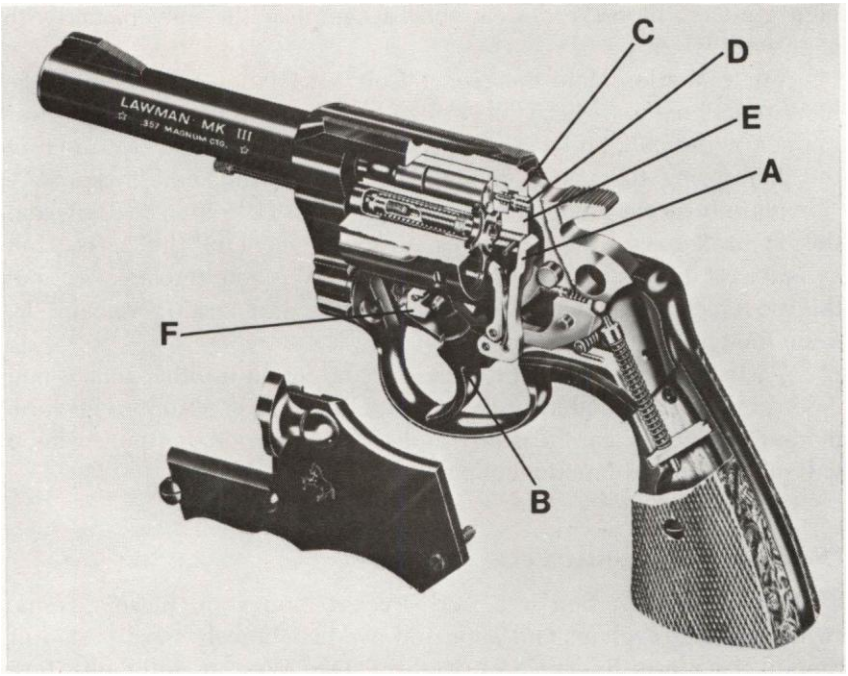
For example, while the recent Colt MKIII design resembles the S&W functionally, earlier Colts utilize a separate trigger actuated lever to operate the bolt, and a separate pivoted lever activated by a limb of the mainspring to provide rebounding action. And, where the S&W side plate is on the right side of the frame, the Colt is on the left, and this in itself necessitates changes in arrangement of the parts. Colt cylinder rotation is also clockwise, while S&W is counterclockwise, but the movements to achieve cylinder rotation and locking remain the same though somewhat reversed.

Various other detail differences will be found in other makes and models, but if one understands thoroughly the S&W example given, a modest amount of careful study and examination of the gun in hand will make all of its functioning clear.

Double-Action Transfer Lever

This type of action is a fairly recent innovation in solid-frame swing-out DA revolvers and appeared over a relatively short period of time in the Sturm-Ruger (Security Six), Dan Wesson, and Colt Mark III actions. Again, they differ in detail, but all function generally the same.

Use of a transfer lever, riding between hammer face and a separate frame-mounted firing pin, eliminates the need for a rebounding action of the hammer to retract the firing pin for safety in carrying. Consequently, the trigger/hand/hammer relationship of these designs remains essentially the same as the S&W type described—trigger movement first disengages the bolt, raises the hand to start cylinder rotation, rotates hammer rearward, and so on. The difference is that a transfer lever is pivoted to the rear of the trigger and when the trigger is at rest (forward) this bar prevents the hammer face from contacting the separate frame-mounted firing pin. It may do so by intruding between a frame shoulder and the face of the hammer, or by withdrawing a lug on its upper end which provides an essential connecting link between the hammer face and the firing pin. Both ways are equally effective, since the trigger is forward, it is physically and mechanically impossible for the hammer to touch the firing pin and equally impossible for even the severest of impacts on the hammer spur to force it into any such contact.



Typical of modern double-action designs with transfer bar is this Colt MK III (introduced 1969) and greatly resembling in function the basic S&W doubleaction design. Transfer bar is at (a), and when trigger (b) is forward, hammer contacts frame solidly at (c), unable to reach firing pin (d), because of relief cut at (e). When trigger is held fully rearward, transfer bar rises to lay over firing pin, and is struck by hammer at (e), transferring the blow directly to the head of the firing pin. Note cylinder bolt (f) and its similarity in design and function to the earlier S&W. Use of transfer bar eliminates need for the traditional rebounding hammer which is provided in older Colt designs by the separate rebound lever acting on the hand, and in S&W by the rebound slide acting on the foot of the hammer.

Typical of this is the Colt Trooper Mark III in which the hammer face is smooth with the upper portion contacting a solid surface in the frame, while directly beneath that the face is relieved so that it cannot contact the head of the firing pin even when the hammer is fully down and resting on the frame. Then, there is an L-shaped lever pivoted to the rear of the trigger, and as the trigger is pulled in DA cycling, or as the trigger is moved rearward by the hammer in SA cycling, this lever is raised so that at the instant of DA hammer release or SA full-cock, its upper end lays over the firing pin head. Then, when the hammer falls—providing the trigger continues to be held to the rear—the relieved portion of the hammer face strikes the transfer lever, driving it against the firing pin head, and thus firing the cartridge in the chamber.

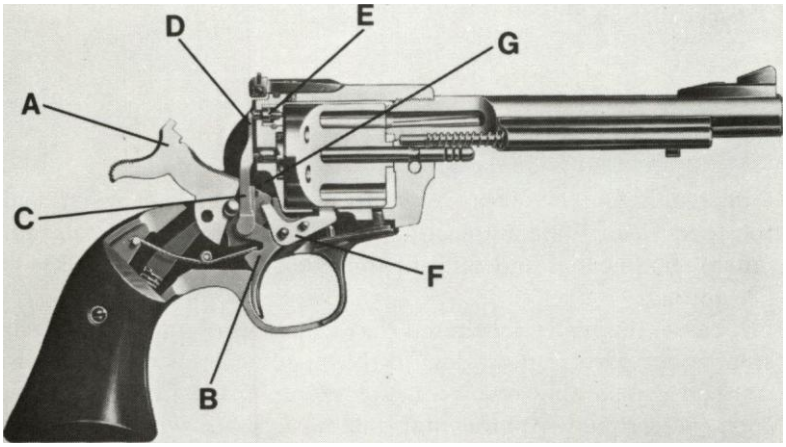
Then, when the trigger is released and driven forward by its spring, it retracts the transfer bar and allows the solid, upper portion of the hammer face to contact the frame, removing all contact (or possibility of contact) between hammer and firing pin. At this point, the firing pin is automatically retracted within the recoil shield by its own internal spring.

The foregoing are the essential characteristics of a transfer-bar system and constitute its differences from the older rebounding-hammer DA systems.

TRENDS IN SINGLE-ACTION REVOLVERS

We now have transfer bar SA systems entering the scene, thus far represented only by the 1973 Ruger design identified as the “New” Single Six and the “New” Blackhawk series.

In this SA design, a transfer bar is likewise linked to a rearward extension of the trigger and when the trigger is held fully rearward, it lays between the firing-pin head and a relieved portion of the hammer face, thus providing a mechanical connecting link for transmission of the hammer blow to the firing pin. When the trigger is in the forward position, the transfer bar is retracted, and a solid portion of the hammer face contacts a corresponding face in the frame, and there can be no contact between hammer and firing pin. Immediately after a shot is fired, releasing the trigger causes it to withdraw the transfer bar, which uncovers the firing pin head, and allows its own spring to retract it within the recoil shield.



This New Model (1972) Ruger Single-Six, single-action revolver represents the highest development of the traditional single-action type. It utilizes a minimum of components and is fitted with a transfer bar for complete safety from accidental discharge, (a) hammer; (b) trigger; (c) transfer bar connected to trigger so that its upper tip, (d), provides mechanical connection between hammer face and firing pin, (e), only when trigger is held fully rearward; (f) cylinder bolt; (g) hand, connected to left side of hammer.

This Ruger feature makes it perfectly safe to carry a SA revolver with the hammer down and all chambers loaded. It eliminates the need for a safety notch as is found in older guns.

In addition, the new Ruger contains another unusual feature which eliminates the need for a loading or half-cock notch. When the loading gate of the new Ruger is swung open, it withdraws the cylinder bolt by means of a heavy spring, and thus frees the cylinder to be revolved manually for extraction and ejection of fired cases and reloading. This eliminates any need for pulling the hammer part way back to disengage the bolt, and for a notch to hold the hammer in that position.

This generally covers the functioning of most revolvers that will be encountered today, with the one exception of the many so called "Saturday Night Specials" or "Suicide Specials" which are generally cheap, flimsy revolvers that cannot really be economically repaired. Very few owners of a $20-gun will be willing to pay even a reasonable, minimum fee for repairs. It is usually more economical to replace such a defective gun than it is to repair it.

FUNCTIONING—AUTOLOADERS

So much for revolvers. Now, let's take a look at what makes autoloaders tick. While autoloading pistols may appear to many to be far more complicated and difficult to understand than revolvers, they really are not.

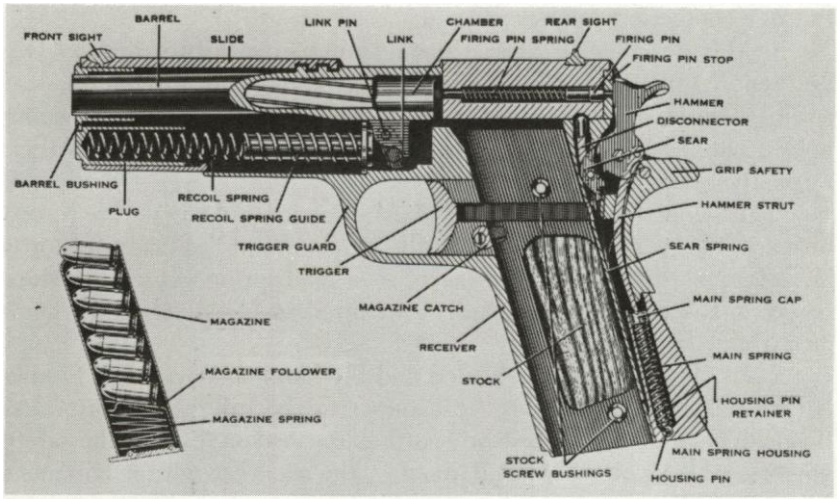
It can easily be demonstrated that a number of autoloader designs possess fewer parts and are less likely to suffer breakage or excessive wear than comparable revolvers. For example, the Colt Government Model ·45 ACP auto pistol contains 32 basic parts, while the contemporary Colt Official Police revolver contains 43 basic parts. Of course, some parts such as screws and stocks are duplicated, but the duplication is about equal between the two. The comparison becomes even more obvious in some more recent pocket-pistol designs which have as few as 25 basic parts. A revolver with so few parts would be rare indeed.

Like revolvers, autoloaders of today fall into both single-action and double-action categories. And, it is in these areas, the lockwork, that most people find the most confusion. Generally speaking, the functioning of slides, extractors, and firing pins with relation to barrels and frames are relatively easy to understand because they can be seen clearly when the gun is cycled by hand. Then, too, these areas of the functioning cycle remain the same in most instances, regardless of how the lockwork of the guns might differ.

So, for the time being, let's confine ourselves to the lockwork and firing mechanism of autoloading pistols, differentiating between SA and DA types.

SA Autoloader

Typical and probably the most familiar of this type is the venerable Colt/Browning Government Model (M1911, M1911A1) which has remained the U. S. Service pistol for well over six decades. It is of single-action lockwork, meaning that when the gun is fully loaded and with the hammer down for safe carrying, the hammer must be manually cocked before the first shot can be fired. Firing the first shot leaves the hammer fully cocked, as does each subsequent shot, until such time as the hammer might be manually lowered to holster the gun.



Colt Gov't Model (GM) ·45 pistol illustrates all the essential elements of a locked-breech, single-action design.

To accomplish all this we have a hammer pivoted at the rear of the frame, a separate sear pivoted next to it, a sear bar (or in this instance a stirrup riding between the sear and the trigger) and the trigger itself. In this instance, the trigger is an integral part of the stirrup, and the stirrup is hollowed so that the cartridge magazine may pass through it without interfering with its movement.

It would seem that these parts are sufficient to provide the train of action needed to release the hammer from full cock, but an autoloading pistol also requires a device known variously as an interrupter or disconnector which breaks the connection between the trigger and sear when the breech opens after firing, and which does not reestablish that contact until the breech is again fully closed and locked. If this device did not provide this function, then initial pressure on the trigger would rotate the sear and drop the hammer to fire a cartridge and the gun would recycle more rapidly than the trigger could be released, thus leaving the sear disengaged from the hammer, allowing the hammer to ride down on the slide, and possibly fire subsequent rounds in machine gun fashion. Not at all a desirable condition.

So, in the Colt/Browning design, the disconnector is provided in the form of a vertical plunger in the frame whose lower end is flattened and provides a connecting link between stirrup and sear. In addition to this, we have a spring pressing forward on the tail of the sear, thus forcing its nose back against the hammer; a spring forcing forward on the stirrup to provide trigger return action; and a spring providing upward pressure on the disconnector, holding it in position to make contact between stirrup and sear.

In this design, these three spring functions are provided by two different-lengths and differently shaped limbs of a three-limb, leaf spring identified as the sear spring. It fits beneath the mainspring housing at the back of the frame and the two limbs press upon their respective parts.

Thus when the hammer is down, the stirrup and trigger are forced forward, the sear is forced against the hammer and the disconnector is forced upward. In addition there is a mainspring which provides power to the hammer by means of a curved strut pinned to the hammer.

Thus, when the gun is loaded and the hammer down, functioning is initiated by first drawing the hammer to the full-cock position. As this is done, a click will first be heard as the sear snaps into the safety notch. This is a notch provided about 1/4 the way through the hammer's rotation and is not intended as a carrying safety. Instead, its function is that of an intercept notch, in that it is intended to intercept the hammer and prevent it from striking the firing pin if the hammer is inadvertently allowed to fall.

As hammer rotation continues, the sear nose will snap into the full- cock notch and hold in that position. Now, if the slide is fully forward and the breech is locked, a notch in the underside of the slide will be aligned directly over the top of the disconnector, allowing it to be pushed fully upward by its spring, and form the connecting link between stirrup and sear.

Pulling the trigger rearward will now move the stirrup back against the foot of the disconnector, pressing it against the lower tip of the sear, rotating the sear nose out of the full-cock notch and allowing the mainspring to drive the hammer forward.

The hammer face will strike the protruding rear end of the firing pin, driving the firing pin forward in its recess, simultaneously compressing the firing pin retracting spring, and firing the cartridge.

As the slide moves rearward in recoil after the shot, the notch accommodating the top of the disconnector moves away, and its sloping edge cams the disconnector downward, removing the connecting link between stirrup and sear, allowing the sear spring to force the sear nose back against the foot of the hammer. The slide continues rearward, riding over the face of the hammer and rotating it rearward, past the point where the sear nose can snap into the full-cock notch— then as the slide starts forward again, it rides off the hammer, allowing the hammer to rotate slightly forward and engage its sear notch with the nose of the sear and be retained at full-cock.

The slide will now move fully forward into battery, more rapidly than the trigger finger can relax trigger pressure, and again align the disconnector notch with the tip of the disconnector. However, until trigger pressure is relaxed, the disconnector is blocked from moving upward and reestablishing contact between stirrup and sear. When trigger pressure is relaxed, the disconnector spring then forces the disconnector upward and contact is reestablished between stirrup and sear, and a subsequent pull on the trigger will drop the hammer from full cock, fire the cartridge in the chamber, and cause the entire cycle to be repeated.

This portion of the cycle will remain essentially the same, with both SA and DA autos, even though sear movement may be initiated by forward rather than rearward movement of a connection between trigger and sear, and even though the function of the disconnector may be taken over by nothing more than a hump upon the sear bar and a corresponding notch in the slide. Function remains the same, even though shape and placement of parts may change.

Functioning of the balance of the gun is equally simple. Recoil energy from the shot forces the locked-together barrel and slide rearward within the limits of their attachment to the frame. The barrel can move only a fraction of an inch, and is secured to the frame by a short, pivoted link. Therefore, as the barrel moves rearward with the slide, this link rotates about its attachment (slide stop pin) in the frame and thus pulls the rear of the barrel downward, disengaging the locking ribs on its upper surface from corresponding recesses in the slide. At this point the barrel halts and the slide—being unlocked from the barrel—is free to continue rearward under its own momentum. As this occurs, the extractor hook in the right side of the breech draws the empty case out of the chamber by its grip upon the case rim. The case is carried rearward with the slide, and near the end of the slide's travel, it passes over an upright ejector, striking the case head against it, pivoting it about the extractor hook and hurling it from the gun. During this action, the rear of the slide is riding over the hammer and forcing it to full cock.

The slide is halted in its rearward travel by a shoulder on its underside meeting a corresponding shoulder in the frame. At that point, the magazine spring has forced the next cartridge in the magazine up against the feed lips, with its head intruding into the path of the slide breech face. Then, the recoil spring asserts itself and drives the slide forward and the breech face strips the cartridge forward out of the feed lips.

As the cartridge is stripped forward out of the feed lips, it rises somewhat on the breech face and the bullet strikes the feed ramp and is deflected upward. As the slide continues to move, the upward- deflected bullet strikes the roof of the chamber and is deflected downward, aligning the cartridge with the chamber and moving the head of the cartridge up under the extractor claw. The slide continues forward, chambering the cartridge, and strikes the rear face of the barrel. It continues onward farther, now pivoting the barrel link upright again, causing the barrel to be raised, engaging its locking ribs with corresponding recesses in the slide roof. The depth of the locking ribs and their recesses and the length of the barrel link combine with barrel/ slide contact and barrel lug contact with the slide stop to halt forward movement of slide and barrel on the frame positively and consistently at the right point.

And, at this point, the disconnector notch in the underside of the slide is again aligned with the disconnector, and when the trigger is released, the disconnector rises to reestablish contact between stirrup and sear, leaving the gun ready and cocked for the next shot.

One other function remains unexplained, that of the slide stop. This is a member pivoted on the left side of the frame which moves upward to engage a notch in the slide after the last cartridge from the magazine has been fired and thus holds the slide in its rearward position, signifying that the gun is empty, and making subsequent reloading easier.

This slide stop is raised at the proper time by a lip on the magazine follower, engaging the slide stop when the magazine spring presses it fully upward in the magazine body after the last cartridge is stripped forward. The follower cannot rise high enough to do this until the last cartridge is out of the magazine. So much for the basic functioning of the single-action autoloading pistol.

DA Autoloader Functioning

Double-action autoloading pistols function essentially the same when manually cocked for SA fire of the first shot, and also for subsequent shots which leave the hammer at full cock.

Comparison of the standard M39 (above) and ASP (below). Note altered trigger guard for two-hand shooting.

The difference in functioning occurs only during double-action firing of the first shot when the trigger is pulled through to both raise and drop the hammer. To illustrate this, let's use the Smith & Wesson M39 design which is typical of this type.

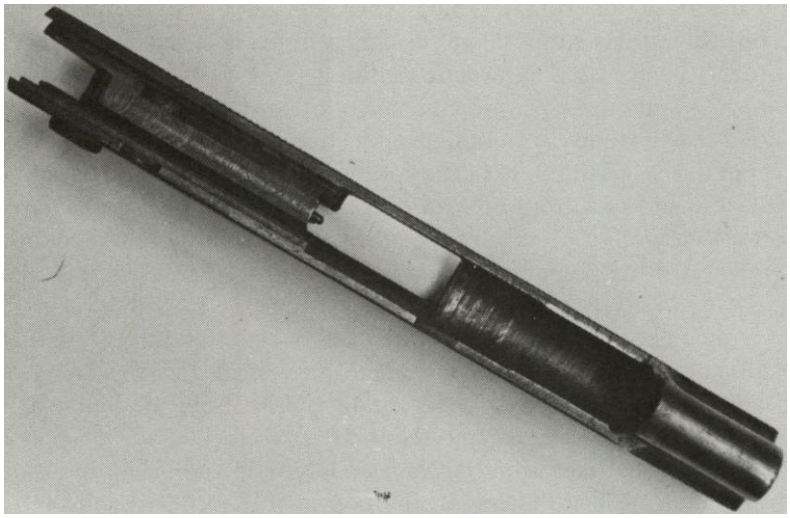
With the hammer at rest and the trigger forward, a drawbar connected to the upper limb of the trigger is positioned so that a hook at its rear lays directly behind a protrusion on the foot of the hammer. Rotating the bottom of the trigger rearward causes its upper limb to pull the drawbar forward. The drawbar contacts the foot of the hammer, rotating it forward and the top of the hammer rearward. As drawbar movement continues, the hammer approaches the full-cock position, and at the same time a surface on the drawbar pulls the sear nose out of the path of the hammer. Shortly thereafter, a cam surface disengages the drawbar from the toe of the hammer, and the hammer is driven forward by its mainspring to fire the cartridge.

After the cartridge is fired and the slide begins to recoil rearward, the disconnector is cammed downward by the slide to disengage the drawbar from the sear and to force it out of the path of the hammer. Just like in the SA autos, then, this allows the sear to engage the hammer when the slide forces it to full cock, and makes it necessary to release the trigger again after the shot before a subsequent shot can be fired.

All other basic functions of the DA auto are essentially the same as the SA auto.

Several types of safeties and firing pins are found on autoloading pistols, and an understanding of their operation is necessary. Firing pins are of two types—inertia type and full-length type. Both are seated in a hole drilled through the slide from the hammer position to the breech face. The full-length type firing pin is longer than the hole in which it rides, and therefore if a cartridge is chambered and the hammer is fully lowered, the hammer rests on the head of the firing pin and the tip rests on the primer. This sets the stage for an accident should the hammer be struck a blow, or if the gun should be dropped so that it falls on the hammer. Hammer impact will be transferred directly to the firing pin which will detonate the primer. Consequently, this design is seldom encountered in current autos, though it is still found in some models of Star pistols.

The inertia-type pin is shorter than the hole in which it rides, and is held rearward by a spring so that a small portion of its head protrudes to be struck by the hammer. Then, when the hammer strikes it, the hammer is halted by a surface on the slide, and the firing pin continues forward of its own momentum to detonate the primer. Afterward, it is retracted by a spring, to ride against the hammer face until the hammer is cocked at which time it moves farther and protrudes again, ready to be struck by the hammer for subsequent shots.



If an auto firing pin protrudes from the breech face even slightly when the head is flush with the rear slide face, then it is not an inertia-type firing pin, and the gun may not be carried safely with a cartridge chambered and the hammer fully down.

Without compiling a list of hundreds of make and model variations and listing the type of firing pin they contain, it would be impossible to know without checking the type of pin in a particular gun. This isn't necessary, though, because the pin type can be determined by a quick visual check. To do this, either remove or retract the slide— whichever is most practical—and with a screwdriver or similar instrument depress the head of the firing pin until it is flush with the rear surface of the slide. If in this position the pin does not protrude from the breech face, the firing pin is of inertia type. On the other hand, if its tip does protrude from the breech face, it is of the full-length type.

Thus far we've discussed only hammer-fired pistol designs, and while this type is by far the most common, a few of the modern small caliber pistols use striker-actuated firing mechanisms. In this type, a tubular firing pin rides in a hole in the rear of the slide. The pin is relatively short, and contains a powerful firing pin spring seated partly inside it, and resting solidly against a supporting surface protruding upward from the frame. Thus, when the slide moves rearward in recoil, the spring support on the frame remains fixed there and the spring is compressed between the firing pin and the spring support. When the slide reverses direction and starts to move forward, a spring- loaded sear intrudes in front of a projection on the firing pin and holds the pin in that position, with the spring compressed against its support, while the slide continues on into battery. Then, after normal disconnector functioning (and release of the trigger if this action is following a previous shot) pressure on the trigger withdraws the sear and allows the spring to drive the firing pin forward to fire the cartridge.

Among recent designs, this type of firing mechanism is found only in SA autos. In the distant past there have been designs (now long obsolete) which adapted striker firing mechanisms to double-action lockwork. Few will be encountered today.

While the striker firing mechanism is simple and cheap to produce and is much easier to fit into a tiny pocket-size gun, it is substantially less reliable than a hammer-type mechanism. This is due primarily to the fact that an enclosed firing pin of this sort can have only a fraction of the weight of a rotating hammer. This is particularly true in the smaller guns in which this mechanism is normally found. Consequently, it is adequately reliable only when ammunition and primers are of very good quality and when parts are in perfect condition and thoroughly cleaned. Let a bit of wear develop, a bit of dirt and hardened grease accumulate, or slightly hard primers be encountered, and the striker firing mechanism is prone to misfire. These may not be important in fun shooting, but if the gun is carried for defensive purposes, such a malfunction could prove fatal.

Safeties can be terribly confusing, and they do not always function as they might appear to. In SA autos we have safeties that block the sear in its full-cock position and are thus known as sear-blocking safeties and they prevent trigger pressure from disengaging the sear from the hammer. The Colt/Browning safety is of this type and it is really the least safe of all the manual safeties because of the small contact areas with which and upon which it acts.

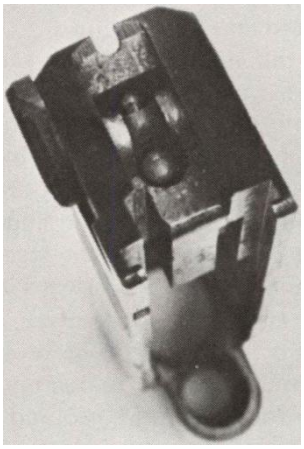
Next we have the hammer-locking, sear-unloading safety which acts upon a protrusion on the base of the hammer to rotate the hammer slightly past full-cock position and thus take the strain off the sear. It not only lifts the hammer clear of the sear, but it locks it in that position with a solid steel shaft so that even a severe blow on the hammer cannot force it forward to fire the gun. The advantage of this type over the sear-blocking safety is that a blow on the hammer in the latter case will simply transfer the impact to the rather delicate sear nose and full-cock notch, and may cause them to break, allowing the hammer to move forward and fire the gun.

This Colt/Browning safety, shown here engaged, merely blocks the sear. Note also the protruding grip safety which is automatically depressed (disengaged) when the gun is gripped.

The third type is the hammer-blocking safety and it does not act directly on either the sear or the hammer, nor is it even located on the frame as are the other two. It is situated at the rear of the slide, and when engaged it simply rolls a solid steel barrier over the exposed head of the firing pin. The sear and hammer are still free to move, and trigger pressure will disengage the sear and allow the hammer to fall—but, the hammer can strike only the steel barrier over the firing pin and thus the pin cannot be driven forward to fire the cartridge.

Theoretically, this type is the safest of all, in that it has the largest engaging surfaces and is least likely to be broken. On the other hand, it is the most inconvenient of all to manipulate, and is not often encountered except in the French M1935 and M1950 military pistols. The principal objection to this type is that it must be engaged, whether the hammer is down or cocked, to prevent accidental discharge. And, when the gun is carried with the hammer down—as it usually is done—the hammer must be cocked manually and the safety must be disengaged manually before the gun can be fired. This requires twice as many actions preparatory to firing as with other types of safeties.

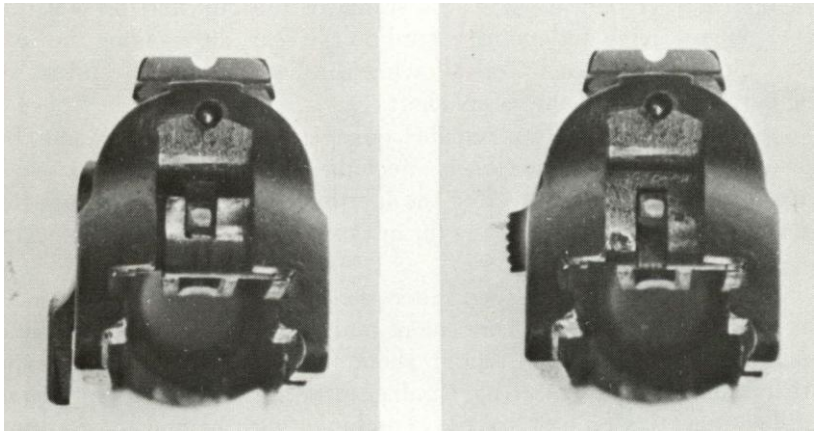
This Star safety is an example of the hammer-locking, sear-unloading type in that it engages a portion of the hammer and lifts the hammer clear of the sear when it is engaged.



This is the hammer-blocking safety of the French M1935 pistol, wherein the safety's only function is to prevent the hammer from striking the firing pin, and it does not block the hammer, sear, or trigger. Shown here in the engaged position, with a portion of the shaft protruding beyond the firing-pin head.

All large autos have one of the foregoing types of safeties, but many smaller pistols have pushbuttons moving laterally in the frame which block either the trigger, trigger bar, sear, or hammer. Thus, they may be classified as trigger-locking, sear-bar locking, sear blocking, or hammer-locking. Almost invariably they consist of a round plunger with cutouts to allow parts movement when disengaged and solid areas which move into position to prevent parts movement when they are engaged.

Double-action autos may be found with any of the foregoing types of safeties, but in most instances they use what is known as a hammer-blocking, hammer-dropping safety. This type combines the hammer-blocking type described earlier and usually rolls a protective shield over or around the firing pin head to prevent the hammer from reaching the firing pin, no matter what else happens. However, they combine with a linkage or lever which disengages the sear and allows the hammer to fall automatically after the hammer-block is rolled into position.



(Left): The Walther Model PP hammer-blocking/hammer-dropping safety in engaged position with a segment of the shaft rotated upward to halt the hammer before it can reach the firing pin. This block is rotated into position before the sear is tripped to drop the hammer. (Right): It exposes the head of the firing pin in disengaged position.

The Heckler & Koch P9 has a simple manual safety on the slide which disengages the trigger from the sear, but also has a de-cocking lever by means of which the concealed hammer is safely lowered upon its loaded chamber, leaving the arm ready for immediate double-action fire.

The safety of the S&W M39 is more or less typical of this type. It consists of a large-diameter shaft passing through the rear of the slide and is cutaway at one point to allow the firing-pin head to protrude through it. This is in the disengaged position. When engaged with the hammer at full cock, the safety shaft first cams the firing pin slightly forward, and then rotates a barrier up over the firing pin head—then immediately after the barrier is in position, a cam surface on the shaft engages a lever beneath it in the frame of the gun and presses this lever downward to act against a stud on the sear, disengaging the sear from the full-cock notch and allowing the hammer to fall and strike the barrier portion of the safety shaft.

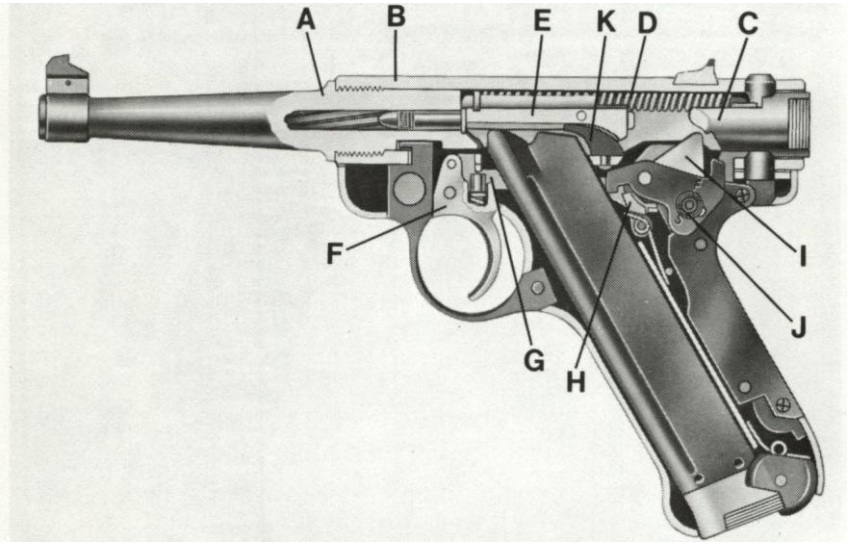
So long as the safety remains engaged, the hammer cannot be cocked, nor can an impact on it affect the firing pin. The safety may then be disengaged, uncovering the inertia type firing pin, leaving the gun safe for carrying and ready for instant DA firing, or thumb-cocked SA fire.

Generally speaking, I consider the hammer-blocking, hammer- dropping safety the most convenient and desirable of all types found on DA autoloaders—even though shooters not familiar with this type are often alarmed when the hammer drops. In all of its principal applications, this type of safety is combined with hammer/sear/firing pin design that makes it entirely safe to disengage the safety again after the hammer has fallen, and carry the gun in this fashion so that no additional preparatory actions are necessary to draw and fire double-action from the holster, just as with a modern DA-revolver.

With the exception of Star and Llama ·380 ACP autoloaders, small caliber pistols (under 9mm) are almost invariably of unlocked-breech or "blowback" design. That is, the breech is not mechanically locked at the time of firing. Instead, secure breech closure is maintained at the instant of firing only by the weight of the recoiling parts (usually only the slide) and a fairly powerful recoil spring. With the exception of the initial opening and final closing stages of breech operation, such pistols normally function just as we've already outlined, whether they be DA or SA.

Since there is no unlocking action necessary, barrels are normally rigidly mounted on the frame and frequently the recoil spring encircles the barrel rather than being placed beneath it as in most of the higher- powered, locked-breech guns.

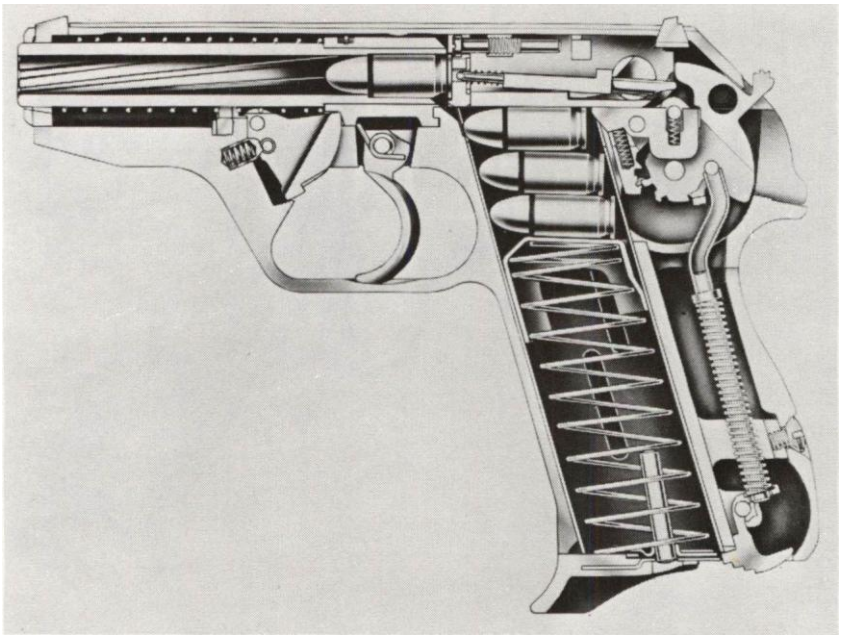
When the gun is fired, backward pressure is exerted on the breech face by the cartridge case and the slide is forced rearward slightly before the bullet leaves the muzzle—yet, this opening movement is so slight that it does not remove support from the thin walls of the cartridge case to allow gas pressure to rupture them. After the bullet has left the barrel and gas pressure inside the chamber and barrel has dropped to nearly zero, the momentum which the slide has acquired during that slight initial opening movement carries it fully to the rear, extracting, ejecting, and compressing the recoil spring—after which the spring drives the slide forward to feed, chamber, and close the breech. During final breech closure, there is no need for barrel or locking system movement, so the slide simply runs up against the barrel breech and is halted thereby. During all this, disconnector function is the same as for other designs and after the breech is closed, the trigger must be released and again pulled to fire the next shot.



This Ruger standard model ·22 rimfire autoloader displays all the basic components and functions of a typical blowback (unlocked breech) pistol, (a) barrel rigidly attached to upper receiver (b); (c) reciprocating bolt; (d) recoil spring; (e) firing pin; (f) trigger; (g) trigger bar; (h) sear; (i) hammer; (j) safety; (k) ejector.

Various other seemingly odd characteristics may be encountered in specific autoloader designs. In fact, we seem to be undergoing a recurrence of several design features once considered obsolete.

An example of this is the separate breech block found in the slides of the HK-4 and HKP9S pistols, and also the new SIG-Sauer M220. In them, the slide is simply a hollow shell formed of stamped and welded sheet metal into which a separate breech block is pinned or locked in lieu of the older one-piece construction. In the most modern designs, particularly SIG and H&K, we find increasing use of stampings and cast parts assembled by welding, pinning, and interlocking in place of the one-piece machined parts to which we have become accustomed. As the years go by, we may expect to see more and more of this type of construction, and, while traditionalists may find it offensive, when such designs are properly executed, they actually simplify repair and parts replacement. For example, where an oversize firing pin hole in a Colt/Browning autoloader requires slow and painful welding and re-machining or fitting of a bushing, the HK-4 simply requires quick and easy replacement of a stamped or cast breech block face. The part costs only a few cents, and can be replaced in less than one minute.



This phantom view of the unlocked-breech, double-action HK4 shows the unique interchangeable breech face insert and firing pin displaced by the safety so it cannot be struck by the hammer; some of the more recent features being introduced in modern pistols for which one must keep alert.

With these more sophisticated design and production methods we are also encountering unusual combinations of cocking and uncocking levers, automatic slide stops, dual trigger functions (in one model it is necessary to press the trigger to close the slide and then press it again to fire the first shot) and other unusual design features. At this time, only a few guns of European design and manufacture possess such features, and the general types have not been sufficiently developed to where we can go into any worthwhile, generalized explanation of their functioning. Fortunately, the makers of such guns are supplying their new guns with profusely illustrated brochures which do explain their functioning quite clearly. When one of these guns is encountered, one is best advised to not attempt any repairs (or even disassembly) until the appropriate maintenance and operations brochures are available. If, as usual, the gun comes in without such material, leave it sit while you make haste to obtain same from either the importer or the manufacturer.

Since we obviously can't cover the detailed functioning of all makes and models here, it will be necessary for you to obtain whatever information is available from the manufacturers. All of our domestic makers can supply exploded views and operating manuals or brochures for all of their current models. Some may still have supplies of the same material for discontinued models, but often they are unavailable. When that happens, your best source of information is one or more of the several books and periodicals containing specific model instructions and exploded drawings or photographs.

We list a number of these publications in the appendix headed "Reference Material" and one of your first steps should be to obtain these publications in anticipation of later need. They also form the very best study material you can have for those idle hours when you wish to improve your knowledge of the inner workings of all types of handguns.

CHAPTER 7 - Minor Repairs and Adjustments

Doubtless the average problem you'll encounter won't actually deal with major repairs. More handguns become inoperative through simple neglect than use, and generally when that happens only minor repair, adjustments and/or cleaning is required to make them completely serviceable. Such work requires few tools and supplies, and it's the type of thing that can be done at the kitchen table without difficulty, once you've studied the various mechanisms involved.

CLEAN IT FIRST

Cleaning is the biggest and most frequent problem. This doesn't mean removing the routine residue from firing or the dirt from use, but rather removing many year's accumulation of hardened grease, lint, grit, and dust which plague unused guns. In this respect, I have found revolvers to be greater offenders than autoloaders.

The average revolver is seldom, if ever, cleaned by its owner (other than wiping out the barrel and chambers) because of difficult access to the internal parts. The mechanism is generally sealed tidily behind the side plate which is secured by several small screws. This alone discourages most gun owners from opening up the gun. Those who do remove the side plate for a look at the lockwork are usually scared or confused by the apparently complex mechanism and will not attempt to remove any part or do any detailed cleaning. As a further result, seldom-used revolvers often go 20, 30, 40 or more years without any internal attention whatever, other than possibly an occasional zealous oiling, which of itself creates more problems as the oil collects lint, dust, grit and other dirt and then eventually oxidizes into a hard gummy coating impeding normal parts movement.

I have encountered many revolvers (a few of them carried regularly by police officers who, fortunately, never had to fire them) which were totally inoperative because of massive accumulations of oxidized lubricants and assorted foreign material inside the frame. A large percentage of the "defective" revolvers brought to my attention by the average gun owner require only cleaning in this area to put them in good operating condition.

On the other hand, autoloading pistols are generally quite simple, easy, and foolproof (not, of course, idiot-proof) to disassemble and reassemble to the ultimate degree. As an example, even the most fumble-fingered pistolero can, with only a moderate amount of study and practice, remove every part from its neighbor of the Colt Government Model ·45 auto. This gun, like most other autoloaders, was originally designed for tool-less disassembly by inexpert hands. Nearly all the large, heavy-caliber autoloaders share this characteristic, and even those which do not, still permit partial disassembly with ridiculous ease—which exposes the internal parts sufficiently so that they may be readily cleaned. The smaller autos also fall in this same general category. This ease of disassembly should encourage proper cleaning.

In addition, the average autoloader is devoid of those gaps common to the revolver through which dirt may enter. With magazine in place, the typical autoloader is like a closed door; all gaps and openings closed, except for the muzzle.

All of this means simply that the first step in repairing any revolver or auto which appears to be malfunctioning is a thorough internal cleaning. This is accomplished by first completely disassembling the gun and scrubbing all parts in a good solvent. I use an old toothbrush, and for the more stubborn deposits, a brass bristle bore brush, along with small scrapers filed from strips of brass or aluminum, used to dig deposits out of the recesses which the brushes won't reach.

In the event the design is an unfamiliar one, or for some other reason you don't wish to attempt disassembly, then your best bet is to first remove all stocks and other wood or plastic parts, then simply submerge the gun in solvent to soak at least overnight, or in stubborn cases, several days. After a few hours of soaking, the gun should be sloshed around vigorously in the solution to float out that material which has been dissolved. A very practical way to do this is with a large syringe which can be filled with solvent and used to squirt a powerful, but small stream of it inside the gun (through the several openings) to further aid in dislodging foreign material. The action can also be worked repeatedly under solvent to help float out loose material and also to promote solvent penetration to the slightest crevices.

Often after just this type of cleaning, you will find that the action begins to work correctly. If no other defect is found, then simply rinse the gun thoroughly, dry and re-lubricate it sparingly, and the job is finished. No fuss, no muss, no bother.

Nevertheless, I have occasionally been caught without solvent when a gun needed this kind of treatment. Solvent may be the best, but I have found that a water and detergent solution will do nearly as well if heated. I simply take a metal container large enough to hold the gun, fill it 2/3 full of water and detergent, drop in the gun (less wood and plastic) and bring it to a vigorous boil on the kitchen range. You'll be surprised at the amount of crap that dissolves and floats out to the surface of the water. When using this method, have a spray can of water-displacing oil handy and immediately upon taking the gun out of the water, wipe and dry it, then spray it with the oil to prevent the immediate rust which would otherwise form.

DAMAGED GRIPS

Following cleaning, probably the most common minor repair is patching or replacing damaged grips. More often than not they will be of wood, original factory equipment, and probably gouged or chipped at the butt, or occasionally split. Chips and gouges are most easily disposed of by merely sanding or filing the edges of the butt to a gentle radius which removes them. If a piece of matching wood is available, you can instead carefully cut out the damaged portion, glue in a closely fitted piece of wood and then file and sand it down to match the original surface. Splits are another matter. If of long duration, they will probably be filled partially with dirt, oil, and/or grease, and no glue will hold until this is cleaned away. The simplest method is to pry the pieces apart and extend the split until they separate. Then carbon tetrachloride or a similar solvent can be used to dissolve away all grease, oil, and dirt—after which the split surfaces can be coated thinly with a good epoxy cement and clamped firmly together until the joint is cured. The joint will be stronger than the original wood.

Wood stocks that have become loose on the frame from wear, from being improperly fitted originally, or from shrinkage, can be tightened easily. After removing all grease and oil from the inner surfaces of the stock, clean the mating metal parts thoroughly and coat them with release compound from a glass-bedding kit. Then simply mix the glass-bedding compound and apply a small spot of it to the wood at the loose point, and press the stock in place. Use rubber bands or tape to hold the stocks securely in alignment until the glass material has set and cured. When doing this, make certain the glass does not flow into areas where it will glue the two halves of the stocks together, or into areas where it might interfere with function of the gun parts, or run into undercut areas where it would lock the grip permanently to the gun. This is best avoided by mixing the bedding material thicker than usual so it will not run so easily.

Plastic stocks are another matter entirely and many of them will be found chipped, cracked, or completely broken. If all the original parts are still present, it is usually possible to cement them together with one of the liquid cement/solvent compounds made for use with plastic model airplanes. Many different plastics are used for stocks, and the only way to determine which solvent will work on a particular one is to try several. I have found that the liquid made for use with polystyrene models and the type made for use with plexiglass will handle most plastic stocks.

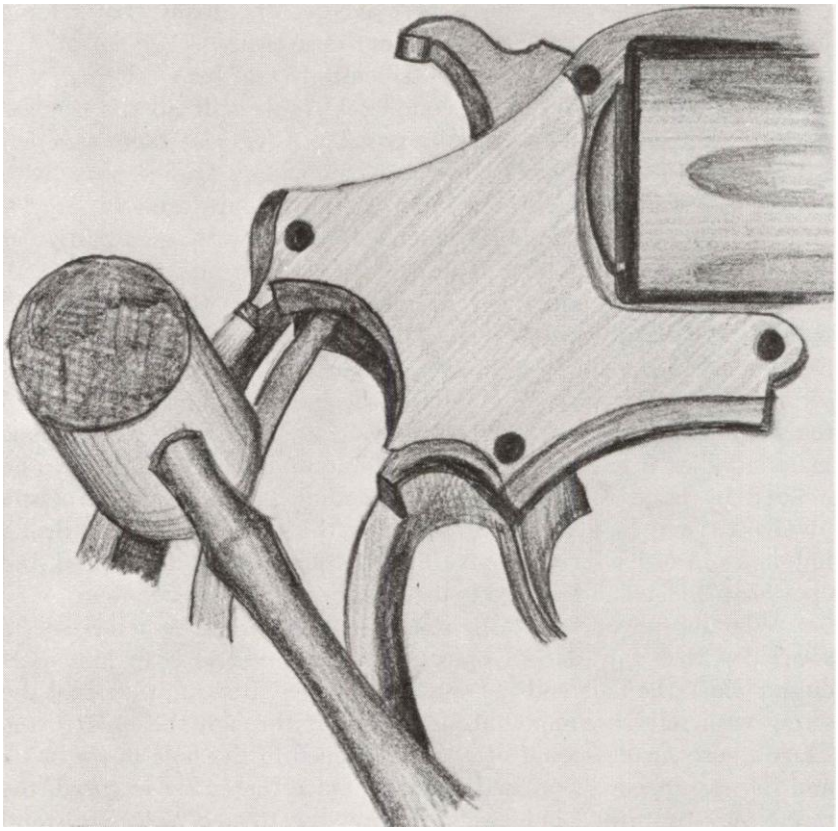
If part of the stocks are missing, your best bet is to use a quick- setting epoxy, first spreading a thin coat over the damaged area and the surrounding areas and then following up with more of the same material when it has begun to set, building up enough thickness to be molded by hand to fill in gaps. Depending on the type of plastic involved, it may be necessary to rough up the surface or even to drill a few holes in order for the epoxy to grip. Once completely cured, the epoxy can be filed and sanded to match the original stock contour.

Whether in wood or plastic stocks, loose screw escutcheons can be secured with a tiny dab of epoxy. The best method is to first thoroughly clean the hole and the outside of the escutcheon, then coat the screw with release compound, and place it through the escutcheon. Then a very small amount of epoxy is placed in the hole in the stock and the escutcheon is pressed in place. Once the epoxy is cured, the screw may be turned out easily, leaving the treated hole clean and clear and the escutcheon held tightly forever.

There is no cure for warped or distorted plastic stocks. I have tried heat and solvent and pressure, and all I ever succeeded in doing was worsen the condition. When stocks of this sort are encountered, the only practical approach is to throw them away and either purchase or make replacements.

REPLACING SCREWS/PINS

Probably the next most common job is the replacement of disfigured screws and pins. A high percentage of revolvers will be found with badly disfigured side plate screws, resulting from attempts to remove them with ill fitting, dime store screwdrivers. Unless the screw is rusted in solidly, this is the simplest of all repairs if you have provided yourself with properly shaped screwdrivers which fit the many sizes of screws found in handguns.



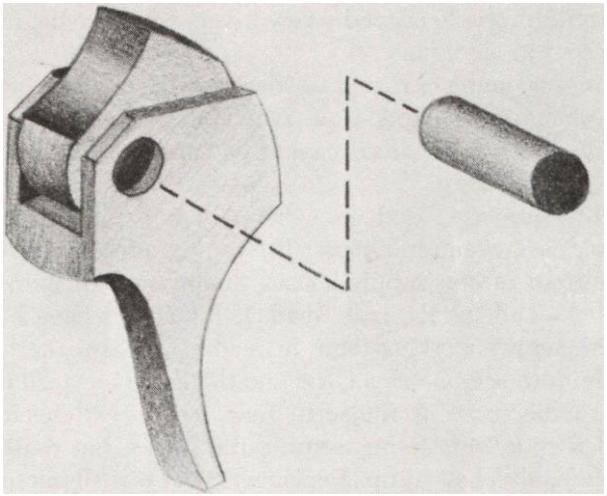
Never attempt to pry side plates out; rap on frame with a soft hammer and the plate will pop out, but take care it doesn't jump out onto the floor and be damaged by the impact.

If you encounter a rusted-in specimen, check the section dealing with overhauling the SAA Colt, where the procedure for removing same is discussed in detail. It cannot be considered a minor repair, so won't be covered here.

With a properly fitted screwdriver, it is a simple matter to turn out the old screw, and in almost all instances proper replacements are available from various supply houses. Simply turn them in after cleaning the hole, and the job is finished. If difficulties have been encountered with screws working loose under recoil, clean the hole and the new screw with acetone on a Q-tip and then apply a small drop of Loc- Tite when the screw is replaced. Few screws will be found on an autoloader aside from those securing the stocks, but those are almost invariably badly chewed up. Replacing them is a simple enough matter, just as outlined above for revolvers, but on big Colt and some other models, you may find that when attempting to remove a screw that the stockscrew bushing sticks tightly to it and comes out of the frame. When that happens, you can worry the bushing and screw apart by clamping the latter in a vise or pliers, but it may spoil the bushing threads in the process. If the bushing is not damaged too heavily to be turned back into its hole in the frame, and if the threads in the frame have not been stripped, then cleaning the threads and the application of Loc-Tite will effect a rather decent repair. Nevertheless, it is temporary, and I prefer to apply fusion-type silver solder to both the hole and the bushing (after thorough cleaning), screw the bushing in snugly, and then apply just enough heat to flow the solder. This makes a permanent repair and guarantees that the bushing won't loosen again —yet, if it becomes absolutely necessary to remove the bushing, heating the solder will allow it to be turned out at some later date.

Unfortunately, this will not work on aluminum alloy frames such as those of the Colt Commander and the S&W M39. On such alloy frames, aluminum brazing compound is required instead of silver solder, and the job becomes a major one unless you have experience in this type of work. The aluminum frame is too easily burned or melted to consider this a minor job.

Even when the threads are completely stripped in the frame, silver solder makes a perfectly adequate and proper stock-screw bushing repair.



If interlocking or overlapping internal parts are difficult to position for final assembly, secure them together with small wood or metal "slave" pins which are then pushed out when the main pin is inserted.

Pins with unsightly and battered ends are easily replaced or repaired. Quite often this can be done without disassembling the gun. Many trigger and extractor pins may be driven out by a punch of very slightly smaller diameter than their own, and the punch left in place to hold internal parts in alignment while the ends of the original pin are polished smooth, blued, and the pin then driven back in place. That applies only to solid pins; the roll pin can be given the same treatment, providing a special roll-pin punch is utilized. Personally, when it becomes necessary to remove a roll pin, I always replace it with a solid one made of drill rod.

When any pin is being removed, extreme caution should be taken to insure that the tip of the punch does not slip and mark the surface of the gun adjacent to the pin hole. Likewise, when the pin is being replaced, care should be taken that the hammer or drift does not damage the surface around the hole. Many a job has been spoiled at the last minute by carelessness in this area.

JAMMED CYLINDERS

S&W revolvers have a design characteristic that often results in the cylinder being jammed shut and refusing to open or to rotate. This occurs only when the gun is neglected or in the hands of someone who does not understand its construction, but it can be corrected in only a moment or two. The knurled cap on the end of the ejector rod is threaded in place. If it is not turned on quite tightly (and preferably secured with a drop of Loc-Tite), firing vibrations may cause it to loosen and gradually unscrew, moving forward to jam fast against the underlug, whose rear surface is only a few thousandths of an inch away. When this happens, the cylinder may be opened only with difficulty, if at all, and in severe cases, the cylinder may refuse to rotate.

When this occurs, the cylinder may be freed enough to be opened by pulling the trigger back just enough to barely withdraw the bolt from the cylinder notch, and holding it there while the cylinder is rotated clockwise (opposite its normal direction of rotation), causing the cap to be screwed slightly back on the ejector rod. It takes careful manipulation of the trigger to withdraw the bolt just enough to allow the cylinder to start rotating, then releasing it to let the bolt snap back up and retract the hand so that the cylinder may be rotated the space of one chamber counterclockwise. The trigger must be manipulated for each chamber-to-chamber segment of rotation, but usually a couple of full revolutions will move the ejector rod cap enough to allow the cylinder to be opened.

Once the cylinder is open, it is a simple matter to wrap a piece of leather or thin lead sheet around the knurled cap and with a pair of pliers screw it tightly in place. You'll encounter hundreds of S&W's with the caps badly disfigured by attempts to tighten them with common pliers applied directly without any padding. The later models have the tip formed integrally with the ejector rod and will not suffer from this problem.

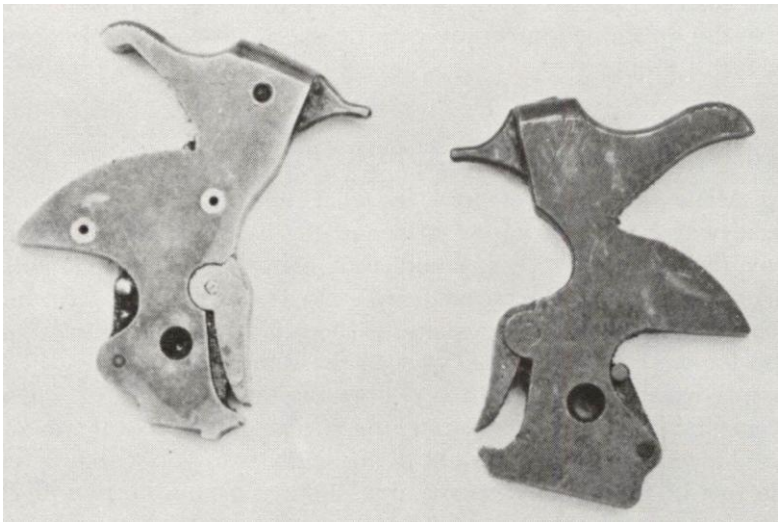
LOOSE SIGHTS—PITTED FIRING PINS

Many older revolvers have the front sight seated in a shallow slot or keyway cut in the upper surface of the barrel. A few autoloaders, even some of quite recent manufacture, used the same system without any reinforcement. I've encountered a number of such guns in which a poor brazing job was done—and the shock of firing caused the sight to pop loose. On other guns, I've seen the sight broken loose when attempts were made to bend it deliberately for targeting or when an accidental bend was being straightened. The only practical way of reinstalling such a loosened sight permanently is to very carefully clean the foot of the sight blade and its slot, then clamp the two together and flow in enough silver solder to be positive that all the gaps have been filled.

Older revolvers and those which have seen hard service, especially with corrosive-primed military ammunition (of which M1917 Colt and S&W revolvers are especially good examples) may have their firing pins badly pitted and rusted. Minor surface pitting only looks bad and creates no mechanical problem, however, when the pitting has progressed too far, there will be too much clearance around the nose of the firing pin, and its shape and protrusion will be altered to the point that pierced primers and/or misfires may result. Or, primer-cup metal may extrude between the recoil bushing and the firing pin and tie up the gun. The only cure for this situation is to replace the pin. If a new one is not readily available, a serviceable replacement can usually be obtained from one of the parts specialty houses.

On S&W and similar revolvers, the firing pin is riveted loosely in a slot in the head of the hammer and the rivet is a tubular affair that is clearly visible. Colt revolvers use essentially the same system, but their rivet is solid, and polished flush with the sides of the hammer, often difficult to discern.

With the S&W type, simply drill in successively larger sizes through the center of the rivet until it can be collapsed and punched out. Then the replacement rivet and pin is inserted, and a conical-tip punch used to upset the straight end of the rivet to fill its recess in the hammer.



Both Smith & Wesson (left) and Colt have similar firing pins and installations, but the hollow S&W rivet is readily apparent, while that of the Colt is closely fitted and polished flush so is difficult to discern.

On the Colt, very carefully locate the center of the rivet and center- punch, then drill through in the manner described. When the rivet will collapse, punch it out, install the replacement, and peen its end until it is tightly in place. Finish by polishing flush with the side of the hammer.

Take care in both instances not to enlarge the rivet hole while drilling, and make certain there is no rivet overhang to catch on the frame as the hammer falls. The firing pin should have slight vertical play, necessary for proper alignment with the firing pin hole in the frame. If the new pin appears too tight on its rivet, the hole must be reamed to a looser fit.

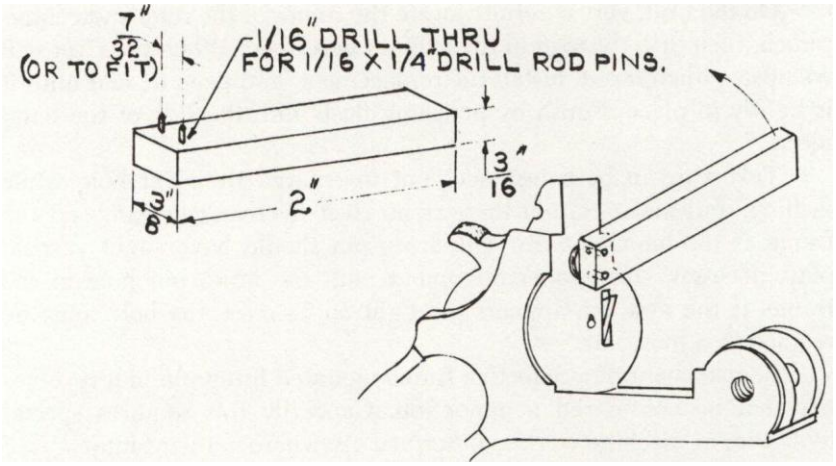
Replacement of a defective frame-mounted firing pin in a revolver may not be considered a minor job. Generally this requires special tools and/or machine work as described elsewhere in this volume.

Firing pin replacement in autoloading pistols is far simpler, requiring in most instances only that a firing pin stop or retainer plate or retaining pin be removed after which the original pin and spring will slide freely out the rear of the slide. The new part is simply dropped in place, and positioned for the retaining device to be re-installed. Typical firing pin installations are shown in the exploded views and the actions necessary for their removal and replacement are clearly evident. However, some of the more recent designs, particularly the Star, have the firing pin retaining pin concealed under the rear sight. In such instances, it is necessary to drift the rear sight out of its dovetail before firing pin replacement can be effected.

MINOR PARTS REPLACEMENT

Other minor parts replacement in autoloaders is generally quite simple and requires no individual hand fitting except in the case where a particularly good trigger pull is required. Trigger work is covered elsewhere in this volume, and the exploded views and assembly instructions of basic types and designs show the various methods necessary to replace most parts.

Revolvers, on the other hand, often require careful hand fitting of replacement internal parts. This cannot be considered a minor repair, and should be conducted in accordance with the instructions contained in the sections on tuning and rebuilding revolvers. Many an embryo pistolsmith has ruined $20 worth of revolver parts because he mistakenly thought they could be replaced as easily as comparable parts in an autoloader.



Above is shown a two-pin spanner wrench required for removal and installation of firing-pin bushings on some old-model, break-open revolvers. Pin spacing is only critical dimension, and should be matched to the gun at hand.

BARREL BUSHING PROBLEMS

The ubiquitous Colt ·45 Government Model (also encountered in ·38 and 9mm) is often found with a barrel bushing quite loose in the slide. This may be corrected very easily, albeit temporarily, by slipping the bushing over a solidly-supported steel rod and then using a sharp prick punch to raise burrs on the outer surface of the portion entering the slide. If these burrs are raised sufficiently and spaced closely together over the entire surface, the bushing will fit the slide snugly and will thereupon be properly centered in the slide. If, after this, the barrel muzzle is noted to be quite loose in the bushing when the gun is fully in battery, a narrow (about 1/8-inch) band of similar burrs may be turned up with a sharp punch just inside the front edge of the barrel hole through the bushing. These burrs will similarly center the barrel in the bushing and will temporarily remove the looseness, though they will wear down rapidly with firing.

The same method may be used to tighten barrel/bushing fit in guns not having a removable bushing, as in the Browning HP and Walther PP series. Just raise a narrow ring of burrs inside the slide mouth with a sharp punch.

EXTRACTION PROBLEMS

In these days of high-performance ammunition and heavy handloads, extraction difficulties are often encountered in revolvers. In a new or little used gun, this is usually due to a rough chambering job, while in older guns the cause is more likely to be rust or pitting in the chambers. In either case, careful polishing will usually cure the problem, but if this is done to a new gun and the problem persists, you may expect the factory to void the warranty if the gun is then sent in for service.

To polish chambers, hacksaw a slit in the end of a metal rod, one that is a little less than half the chamber diameter. Slip strips of the finest-grit abrasive cloth or paper in the cut, then insert in the chamber and spin with your electric drill. Keep the spinning rod moving constantly in and out, but never into the chamber throat. If it spins long in one place, that area may be enlarged and worsen the problem. Don't overdo this, just enough to smooth the rough spots without enlarging the chamber significantly. Don't try to remove pits or tool marks entirely, just polish off their rough edges.

A rough or pitted autoloader chamber will usually respond to the same treatment. Most autos will extract okay with a fairly rough chamber because there is plenty of power available for extraction, with only one case being pulled from the chamber. In revolvers, there are five or six cases to be forced out simultaneously, and only limited finger power is available, so a smoother chamber finish is needed.

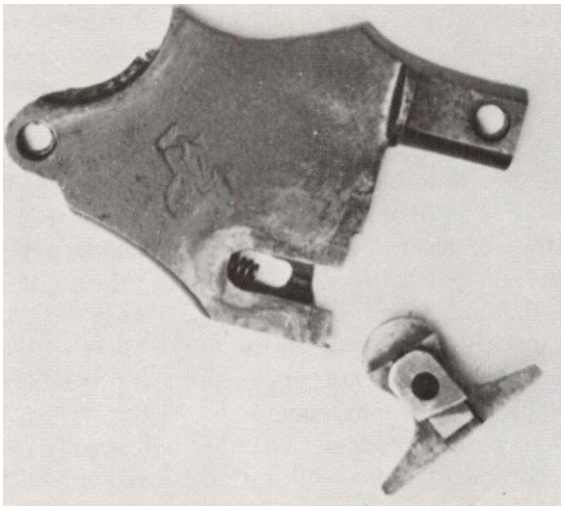
DAMAGED MUZZLES

Any handgun, revolver, auto, or other will lose some of its accuracy if the muzzle is damaged. Dents, nicks, or burrs on the inner edge of the muzzle are the worst offenders. Recrowning with a shaped tool bit in a lathe is the usual way of eliminating such damage, but careful hand application of a 45-degree countersink will do as well.

First, knock off the worst part of the damage with needle files, then use the countersink lightly to produce a clean, narrow, and uniform bevel in the bore mouth. Finish by polishing with abrasive cloth over the ball of your thumb, and the gun will shoot as well as before.

LOOSE SCREWS/WORN THREADS

Screw holes and threads in older guns may become worn oversize. Unless very loose, screws can be made to hold by careful cleaning with acetone, then applying Loc-Tite. If that doesn't work, try wrapping a single strand of steel wool around the screw threads before turning it into the hole. A more permanent repair can sometimes be made by having the screw threads built up with nickel or chrome plate.



Colt thumb latch rides in a T-slot in the side plate, and often becomes quite worn and loose; peening of the edges of the T-lug on the latch will correct this condition.

The thumbpiece of the cylinder latch on older Colt revolvers is often found to be quite loose and wobbly, especially if the gun has been refinished at some time. This part contains grooves which slide over the edges of the side plate slot in which it rides. The inner lips of these grooves can be peened or squeezed outward to close up the grooves a bit and take out that undesirable play.

In the same guns, the latch pin, which enters the rear of the cylinder to hold it closed, may also be worn quite loose. Wear is on both the pin and the hole in the frame in which it rides, but usually more so in the hole. The pin can be plated to increase its diameter and make it a tighter fit.

Older Colt DA revolvers have the extractor and ratchet merely threaded onto the rear of the ejector rod, then staked to secure it. This joint sometimes comes loose through use and abuse. Unscrew the extractor and clean all threads thoroughly. Peen the shoulder on the rod lightly to move it rearward very slightly and allow a tighter assembly. Tin the threads of both rod and extractor, then re-assemble, taking care to get the extractor aligned perfectly with the chambers. Re-stake the end of the rod, then heat just enough to flow the solder, and the job is done.

LEADING

Revolvers, especially ·357 Magnums, are often encountered with badly leaded barrels, and are very inaccurate until the offending deposits are removed. Of the several methods of removing lead from the bore, the simplest is to merely shoot a few loads of jacketed bullets through it. If conventional loads don't do the job, assemble a few handloads with inverted jacketed bullets and shoot them base-first.

This often will clear the bore but still won't take lead out of the chamber throats. For that, use a stiff, oversize, brass-bristle cleaning brush spun in an electric drill, and twist a bit of very fine steel wool into it if necessary. In extremely stubborn cases, plug the rear of the bore, then fill it with metallic mercury and let it stand a few hours. The mercury will amalgamate with the lead, softening it so it is easily brushed out. Repeat if necessary.

STIFF CYLINDER ROTATION

In some late production S&W revolvers, the cylinder will rotate stiffly or not at all when the gun is loaded and pointed upward. This has been traced to sharp edges on the relief cut in the left side of the recoil shield for the ratchet. With the muzzle elevated, cartridges slide rearward and their rims snag on the lower edge of this cut as the cylinder rotates. Stone or file a slight bevel, then polish smooth, and the cartridges will ride smoothly over the former trouble spot.

When cylinder rotation is free in a loaded but unfired revolver, but becomes difficult after firing, check for burrs around the firing pin hole. If they are pronounced, the fired primer will hang up on them. Simply filing or stoning off the burrs restores free cylinder rotation. Of course, this will remove the original finish, and a bit of touch-up may be required, but that area is usually worn bright on a well used gun anyway, so it really doesn't matter very much.

MISC. PARTS—LOOSE, BENT OR BROKEN

Colt Government Model ejectors and spring/plunger housings are merely pinned and riveted in place and often become a little loose on the frame, even though they stay in place and remain functional. Actually, they can't come out so long as the gun is assembled, even if the pins break. Looseness can be cured by first cleaning the contact areas thoroughly with acetone, then applying Lok-Tite to fill the gaps. If the looseness is too great for this fix, flow in low temperature hard solder instead, but take care to avoid overheating the parts.

Occasionally the magazine opening in the butt of an auto will be slightly collapsed from a blow of some sort; not much, just enough to prevent free entry of the magazine. If the amount is slight, a couple file strokes inside the mouth offer a quick and easy repair. Otherwise, a steel wedge may be driven in to cold-straighten the bent part. Lacking a steel wedge, use a very hard wooden wedge with 1/16-inch or thicker steel laid over both sides. Even after wedging, some filing may be necessary to true up the surfaces.

One could go on and on with seemingly minor repairs and adjustments for many pages and still not cover everything which could be encountered. The things already covered should help point you in the right direction, and if combined with the trouble shooting chart in the appendix, will enable you to find your way through other less-difficult repairs that may crop up. As for the more difficult jobs, they are spread throughout the book, grouped together as best they seem to relate to one another.

CHAPTER 8 - Repair and Replacement of Handgun Stocks

It seems as if every shooter owns one or two obsolete autoloaders with broken stocks. I receive more letters asking about sources of replacement grips than I do inquiries about any other part. While grip manufacturers offer replacement grips for numerous obsolete guns, there are still many others for which replacements are almost impossible to obtain.

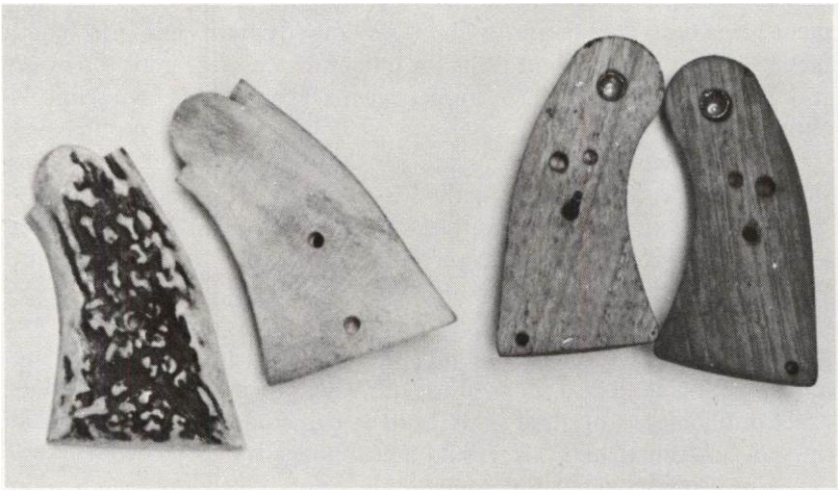
Replacements are easily made for those guns, however, by using slab-type grips. My favorite method is to rough out a grip plate of 1/8- inch thick wood or plastic and then carefully mark and drill mounting-screw holes. The blank is then screwed to the gun and carefully whittled and filed down to a workable shape. (Masking tape placed under the rough grip and over adjacent metal surfaces prevents ruining the gun's finish.) After rough shaping, the replacement grip may be removed and sanded and finished to suit. This procedure won't produce exact duplicates of original grips, but the name of the game is to make the gun functional, and this will do it economically.

Many guns have wraparound-style grips which are much more difficult to make. We will pass on that for the moment, but cover it in detail farther along.

GRIPS CRACKED, SPLIT OR LOOSE

Cracked or split grips are easily repaired if you will remove all grease and dirt first. If the crack does not extend full length, go ahead and break the grip and clean the pieces in carbon tetrachloride to dissolve all grease. Save splinters or small pieces and give all broken surfaces a thin coat of five-minute epoxy and clamp them together in proper alignment. This is most easily done by screwing the grip on the gun and wrapping it securely with rubber bands or tape. Be sure to coat metal surfaces adjacent to the repair lightly with grease, wax, or release compound. After the epoxy has cured, the grip may be removed, excess epoxy dressed down, and the entire grip refinished as desired.

Grips often become loose because either their mounting holes or inletted surfaces have become worn or have shrunk. This problem, too, is easily corrected and the procedure is the same for either plastic or wood: First degrease and clean the grips and the metal surfaces which they contact. Coat all metal surfaces with grease or a release compound. Next, apply a surplus of epoxy or fiberglass bedding compound to the loose-fitting areas of the grips and clamp into place with both mounting screws and tape or rubber bands. Be sure, though, that the grips are aligned properly. Allow the epoxy to cure and trim away any excess.



Both pairs of grips are loose because of oversize locating-pin holes. Coating the pins and the frame with release compound, then putting epoxy in the holes and attaching the grips in proper alignment will make them as tight as new.

Many grips have small bearing surfaces that are subject to rapid wear. For those, build up additional surfaces of epoxy into or against various surface irregularities of the gun. Most often, there will be cutouts in the side of the butt into which beads of epoxy may be fitted. When this is properly done, grips are not likely to loosen in a lifetime of service. In addition, this epoxy reinforcement greatly reduces the probability of splitting or shrinkage. I regularly apply beads of epoxy to inner surfaces of grips around the outlines of the butt cutouts when preparing a new gun such as a Colt Government Model on Smith & Wesson M39 for service.

WORN CHECKERING—LOOSE SCREW BUSHINGS

Chances are you probably have a gun with sound grips, but the checkering has become badly worn. Quite often the wear will be only on one grip—the side exposed when the gun is carried. If a replacement is not readily available, recutting the original checkering with a single-line checkering tool, such as the excellent and economical Dembart line, will greatly improve the grip's appearance and function. If traces of the original checkering remain, it is simply a matter of carefully deepening the grooves with the checkering tool until clean, sharply pointed diamonds are formed. Vigorous brushing with an old toothbrush will burnish the surface and remove the fuzz, after which a couple coats of good quick-drying stock finish may be applied.

Screws and bushings which hold the stocks to the autoloading pistols often cause difficulties. The best installation method is that used in the Colt Government Model and the S&W M39 which have separate bushings threaded and staked into their frames. The bushing fits into a hole in the grip and provides a much larger surface for absorbing recoil and other loads than the shank of a small screw. In addition, if the bushing's threads become stripped, replacing the bushing is much easier than repairing threads cut in the frame.

Many large autoloading pistols usually secure the grips simply by screws entering threaded holes in their butts. When these holes become excessively worn or stripped, your best move is to install Colt or S&W bushings and alter the grips to fit over them. The bushings should be turned in tightly and secured permanently. Staking is not practical without special tooling, thus silver soldering is the most practical method of securing the bushings. Clean the threads (of both the bushings and the frame holes), put flux on the threads, screw the bushing in as tightly as possible, and heat until solder flows freely.

Grip screw bushings shown here are best method of attaching grips to autoloaders. Bushings must be kept tightly assembled to frame.

Use a tiny flame and keep the heat localized so there will be no need for refinishing, nor damage caused to critical heat-treated areas of the frame. This method is by far the best I've found for tightening loose bushings on guns originally equipped with them. Staking or peening is seldom satisfactory, except as a very temporary measure.

Unfortunately, many guns having aluminum alloy frames do not lend themselves to securing grip-screw bushings by silver soldering. For these, use only those solders that will adhere to aluminum, as well as to steel. When soldering is not possible, clean the threads (both in the bushing and in the frame) and use Loc-Tite or a similar nut- sealing compound. If you're in the field and without other equipment, a grip-screw bushing may be tightened by hammering a sharp-pointed punch closely around the mouth of the hole in the frame, which closes the hole slightly so that it grips the bushing tightly. Be careful, though, to avoid closing the hole so much that the bushing will not enter.

MAKING REPLACEMENT STOCKS

Making new, replacement stocks is often not at all difficult, depending upon the type of gun. Simplest is the slab-sided autoloader such as the various Colts. In them, the grip is a simple piece of wood (plastic), flat on the inner side and slightly rounded on the outer with a pair of holes drilled for attachment screws.

For this type, trace the outline and hole spacing on a piece of 1/8 to 3/16 -inch thick wood, then saw and file to shape and drill the screw holes. File and sand in the proper curvature, bevel the edges, and the job is done, unless you wish to add checkering or other decoration, and we won't go into that here.

If the original grips aren't available for tracing, cut holes in a piece of cardboard to match the screw holes or bushings, fit it in place on the gun butt, then trim to the shape that looks right. This will then be your pattern, and it can usually be simply flipped over to serve for the other side.

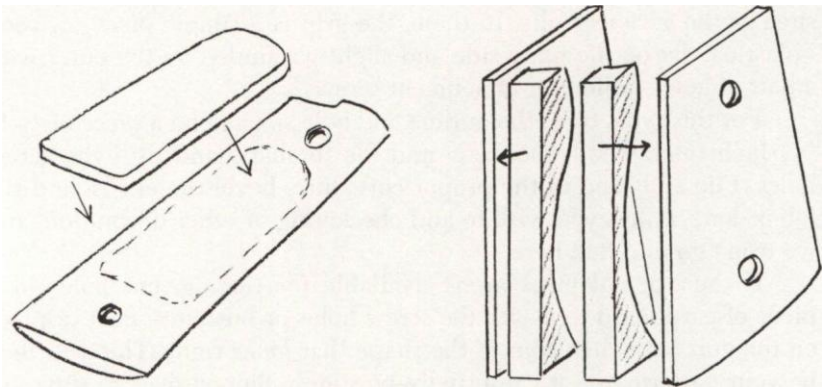
It's a good idea to reinforce them a bit on the inside, especially if you want very thin grips of this type. For this, cut thin plywood (1/16 to 1/8-inch thick) to fit inside the cutouts in the sides of the gun butt. Fit them as snugly in the cutouts as possible, then glue firmly to the inner surface of the grips.

Wraparound-style grips such as are found on the Walther P-38 and PPK pistols are more difficult. Ideally, they should be carved from thick blocks that will meet on the centerline at the rear. If you are good enough at wood carving to accomplish that, you probably don't need advice. If you aren't, then try this much simpler method.

Prepare a pattern as before, extending it rearward to form either the original grip profile (take it from a photo if the original grips are missing) or whatever shape you prefer. Just make sure you allow enough room at the rear to house the gun's working parts and still leave a fairly thick layer of wood over them. Cut and fit the two side pieces from 1/8-inch or thicker wood to include the reinforcement mentioned above, if desired, but leave them flat.

Measure the space between the rear edges of the grips and trim two equal-thickness blocks to fit in this gap. With Moto-Tool or knives and files, shape the front edges of these blocks to clear all working parts. Also, shape the top and bottom edges to butt closely against the frame where necessary.

Now, glue one of these blocks to the inner face of each side piece, aligning them carefully, and making certain that the glue doesn't run between the two blocks. Use a piece of plastic film between them if this prospect worries you. Use a good-quality water and oil resistant glue, not common white glue or household adhesive—I prefer Titebond or two-part epoxies. When the glue is thoroughly cured, rough grips still on the gun, cycle the action to make certain the blocks haven't slipped to interfere with parts movement. If they have, clean up the inside to eliminate any problems.



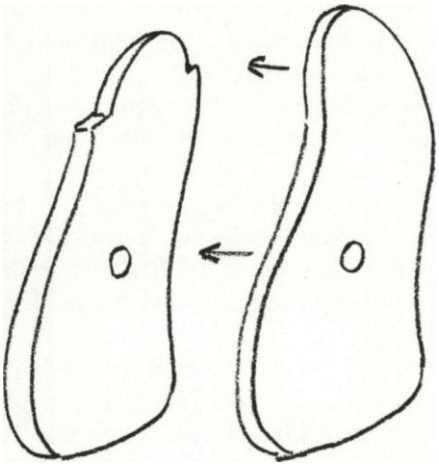
Very thin auto grip plates can easily be reinforced by gluing to their inner face a thin block shaped to fit inside the cutout in the gun frame. This is a lot easier than trying to make such close-fitting grips in one piece, and the joint cannot show at all. Wraparound autoloader grips (right) such as those found on the Walther PP can be built-up like this. Cut the two flat grip plates, then glue in equal-thickness filler blocks at the rear. Take care blocks are glued only to their respective side plates, and not to each other. Shape inner faces of blocks to clear any internal parts such as mainspring, hammer strut, etc.

Now, take your files, rasps, sandpaper, and Moto-Tool and shape the grips the way you want them. Do it on the gun as much as possible, protecting exposed metal with masking tape, unless the gun is to be refinished. If you've used matching wood and fitted the joints closely, the glue line will be nearly invisible after the final finish is applied.

Using this method, anyone can make a set of wraparound grips in one-third the time necessary to whittle them from solid blocks. The Browning H-P pistol uses semi-wraparound grips, and the same method works well for it.

Simple, replacement revolver grips which have the same outline as the metal butt frame are made just as our flat auto grips, with the exception that thicker slabs of wood are required, usually 1/4 to 1/2-inch thick.

If the overlapping upward extension of the S&W "magna" grip is desired, then the use of two layers of wood glued together simplifies the job. Make the first equal in thickness to the step in the frame at the top of the grip, then add the second layer overhanging at the top to form the upward extension. Actually, due to the small area involved, it isn't difficult to carve this step in solid grips. If you can't quite achieve the close fit of the upper shoulder-to-frame cut in factory stocks, go ahead and make it loose, then use glass-bedding or 5-minute epoxy to obtain a precise mating of wood and metal before final trimming and shaping of the outside.



Stepped-out revolver grips such as the S&W Magna type can be glued up in two parts like this, rather than carve them from a single piece of wood. When carefully glued and finished, the joint line is virtually invisible.

Regardless of the method—one-piece or two-piece—finish by shaping with files and sandpaper after proper fitting to the frame.

Oversize or target-type grips, for both revolvers and autos, can be carved from solid wood, but again you'll save time and temper (and probably do a much better fitting job), if laminations are used as described for the wraparound autos. Here it will be a matter of often fitting blocks between both front and rear, perhaps even the bottom, of separate side pieces. Shape the inner faces of these blocks as closely as possible to front and backstraps, obtaining final precise fit by epoxy or glass-bedding if your carving needs it.

Thumb rests and finger ledges or butt flares can also be either carved from solid blocks with much work, or shaped from glued on blocks. I prefer the latter, and you'd be well advised to try it first.

After you've made a set or two of grips by the laminating method, you'll have more carving experience and can do a better job of shaping them from solid blocks.

There is an alternative to both lamination and carving from solid material. There are a couple of sources of inletted blanks for popular revolvers. These are paired blocks with all internal cuts made and screw holes drilled. A little touch-up work will fit them to the frame, after which they may be shaped as desired, and there is plenty of wood for thumb rests and the like.

When working with grips which require complicated inletting, a Dremel Moto-Tool set up in its router attachment will be a tremendous help.

Shaping the outside of the bigger grips can be speeded greatly with either a one-inch belt sander, or a two-inch Stanley Sur-Form drum chucked in the drill press. Both are desirable, the Sur-Form drum for fast cutting, rough shaping, and the sanding belt for smoothing and final shaping.

Finishing wood grips is really simple. If you like them smooth and bright, just sand as smoothly as possible, then apply any good stock finish according to its directions. I usually use GB Linspeed, but there are others you may prefer.

If a rougher finish is desired and you don't want to try checkering, apply a couple of good coats of urethane varnish and let it harden thoroughly. Then apply a thick, third coat, let it half-dry to the tacky state, and sprinkle on it all the finely-ground pumice that will adhere to it. When that is dry, lightly brush off the loose pumice, and add a final, thin coat of varnish. This will give a sandpapery feel which in some respects is more secure than checkering. Another roughening technique, which you can use, is stippling. Do it just as described elsewhere for metal surfaces.

Checkering and carving are beyond our scope here. If you wish to try them on your new hand-made grips, you'll find ample instructions in several general gunsmithing and stocking books, some of which are listed in our appendix.

If you prefer plastic to wood grips, they can be made in exactly the same way. Laminating is by far the simplest, but the joints will be obvious. Some amateur 'smiths turn this into a virtue by using contrasting-color laminations.

Where original grips in good condition can be obtained for patterns, duplicates may be cast from liquid plastic. This involves coating the pattern with a latex material which forms a flexible mold, then using that mold to cast a new part from liquid plastic which hardens. This will usually produce a good copy of plastic grips, but does less well with checkered wood due to its fuzziness inside the checkering. Several hobby supply companies advertise plastic-casting outfits for this type of work and the nearest large hobby or craft shop should also be able to supply kits.

Where wraparound grip security is desired and yet no permanent alteration of frame can be tolerated, pebbled rubber sheet (ping-pong paddle surface) can be cemented to various portions of the gun butt with excellent results.

Fortunately, as the handgun population has increased, several firms have begun supplying replacement grips. They not only offer standard grips for most popular current models, but many special types and styles as well. In addition, they usually offer grips for a wide variety of obsolete and foreign guns. Thus if you need new grips for an old Ortgies or Mauser pistol of WWI vintage, or whatever, chances are one of these firms can supply them in plastic and/or wood, and often in more than one style, color, or finish. Several sources for such grips are listed in the appendix.

CHAPTER 9 - Sight Alterations and Installations

One of the most common complaints we hear about handguns involves their sights. While many a would-be pistolero blames his sights or the gun or the ammunition (or the phase of the moon or the mood of his mistress) for his personal inaccuracies, the fact remains that the fixed sights on many older guns are truly inadequate.

Despite all the romance heaped upon it, the original factory sights of the Colt Single-Action Army are abominable. Essentially the same thing may be said of the M1911 (not so much the M1911A1) Colt ·45 automatic, and many other revolvers and autos of pre-1950 vintage. Generally speaking, such guns have rounded front sights that look like a half or a third of a dime and present a rounded-top view to the shooter.

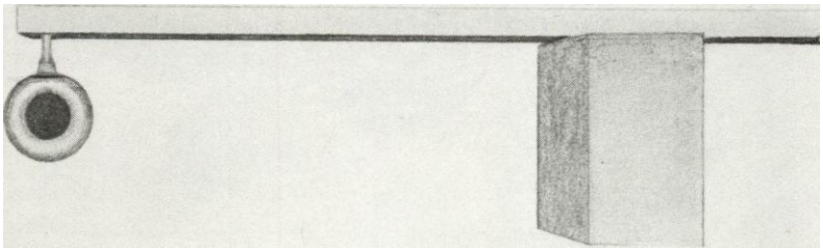
Such front sights reflect light in all directions and make precise definition almost impossible, even under the best of conditions. Rear sights are nearly as bad, generally consisting of small V or U-shaped notches that defy consistent placement of the front sight image, even if it can be defined well.

IMPROVING SIGHT DEFINITION

Such sights can easily be modified to present clear, sharp images that will allow greater accuracy from your gun. Let's take a look first at the autoloaders, using as an example the Colt M1911 ·45. Its thin, rounded front sight barely protrudes above the slide and badly needs replacement. The simplest method is to first file this sight down until only a small stub remains. Then saw and file a new ramp-style sight from 1/8-inch or thicker steel stock. Shape this sight only roughly, leaving it at least 1/16 to 1/8 of an inch higher than the original, and then carefully slot its underside to sit down over the stub of the original. This is easily done with a needle file of the screw head or slitting pattern. Also shape the bottom of this new blade to fit snugly and evenly against the slide. Next, carefully silver-solder the rough sight in place, making certain you get a first-class solder joint upon the slide as well as up on the stub of the original sight. If you're concerned about the strength of the joint, you might want to pin to the original sight stub with one or two pieces of 3/64-inch drill rod.

If the new sight was carefully fitted, there isn't much chance of it leaning during the soldering operation, however, it must be held snugly in place until the solder is hard. Soft iron wire wrapped around the slide and the sight serves well for this. Since the sight is made excessively high to start with, you might even cut a few light file notches in its top to help position the wire and make the binding job easier.

Once the new front sight is in place and properly aligned, go to work on the rear sight, using your needle files to deepen, widen, and neatly square up the rear sight notch so that the proper amount of light may be seen on either side of the front sight when the gun is held at arm's length.



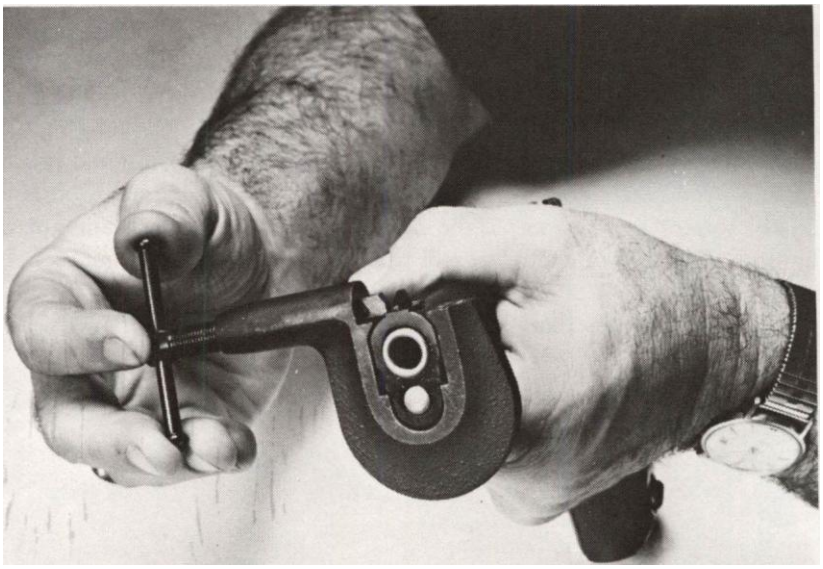
Difficulty is often encountered in clamping a replacement front sight in place for soldering on revolver barrels; this simple block and bar prop holds the sight adequately in place and allows easy alignment.

I prefer no less than a strip of light visible on either side of the front sight equal to at least 1/4 of the apparent width of the front sight. Less light makes the sight difficult to align quickly in poor light, and you may find it even easier to use if the rear notch is made wider still.

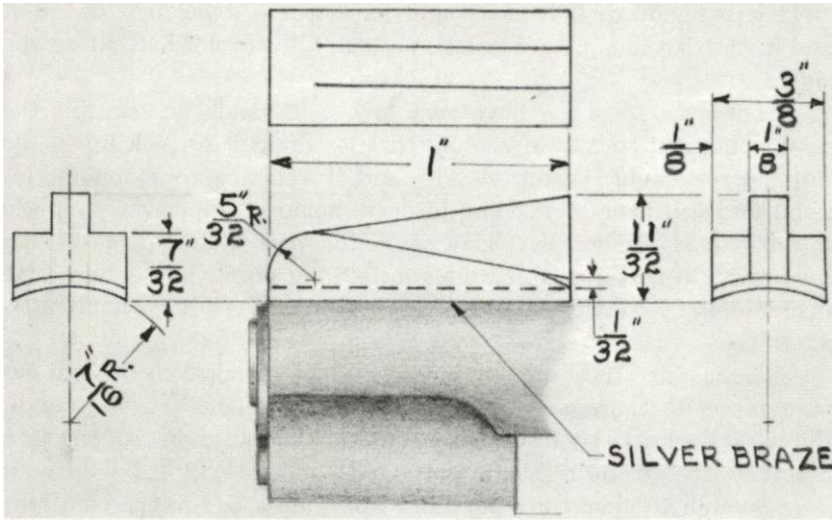
Sharper definition of the rear notch may be obtained (especially in bright sun) if its front edges are beveled outward about 30 degrees or so. Do this very carefully, leaving the inner outline of the notch as thin as possible. Theoretically, a knife edge will give the sharpest definition, but it is too easily damaged, so don't go quite that far.

Once the rear notch is recut, it's time to target the gun with the ammunition you'll normally be using. Pay no attention to windage or lateral adjustment initially, just shoot from a solid rest and successively file the front sight down until bullets are striking level with your point of aim.

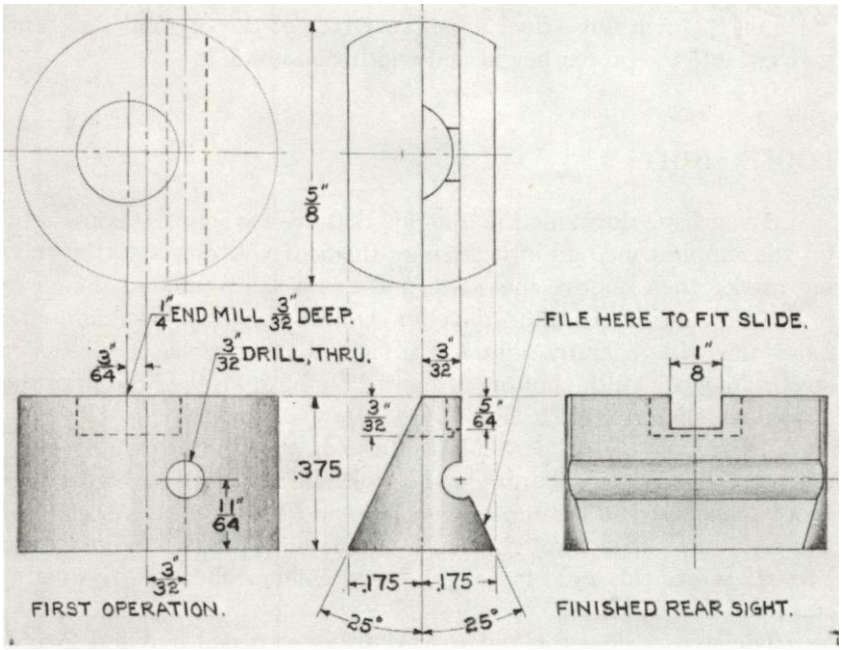
Once proper elevation has been determined, you can drift the rear sight laterally until windage is correct. When that is done, stake the rear sight solidly in place. Unfortunately, too many attempts at staking shift the sight and spoil an otherwise perfect job of zeroing. To avoid this shifting, stake lightly at first and then shoot a group to insure the sight hasn't moved. If it has, put it back where it belongs; and if it hasn't, restrike the staking point very carefully to finish securing the sight.



This sight-moving clamp can be fabricated by welding or soldering blocks to a cheap C-clamp. It may be used to move or remove dovetail front and rear sights, but should fit the slide closely, so different guns require different clamps.



This replacement front sight is easily sawed and filed from 3/4″ square bar stock, and has the added advantage of a wide joint surface which insures that it will not loosen under recoil. In addition, it's an excellent ramp-type design.



This is a fairly sophisticated replacement rear sight for the Colt GM and similar large autos—but its installation requires a milling machine or drill press with milling table.

Some military autos have very low sights and you may file the new front sight so low in zeroing that it's difficult to pick up in the original rear sight. Watch closely, and if you are approaching this point and still have more filing to do to achieve proper zero, replace the rear- sight. High replacement sights for many standard makes and models are usually available from gunsmithing supply houses and some manufacturers. However, lacking that, there are still several alternatives.

The first and most difficult is to file a higher replacement sight out of a piece of scrap steel. This isn't really as difficult as it sounds, though it does take a substantial amount of time. In doing so, choose a block of steel of the right thickness and cut it to width, but leave it long enough to clamp in your vise. First, file the dovetail carefully, with just a slight taper until it will enter the original dovetail on the slide. Next thin down the upright portion, cut it to the height you want, drive into the slide's dovetail and file the notch.

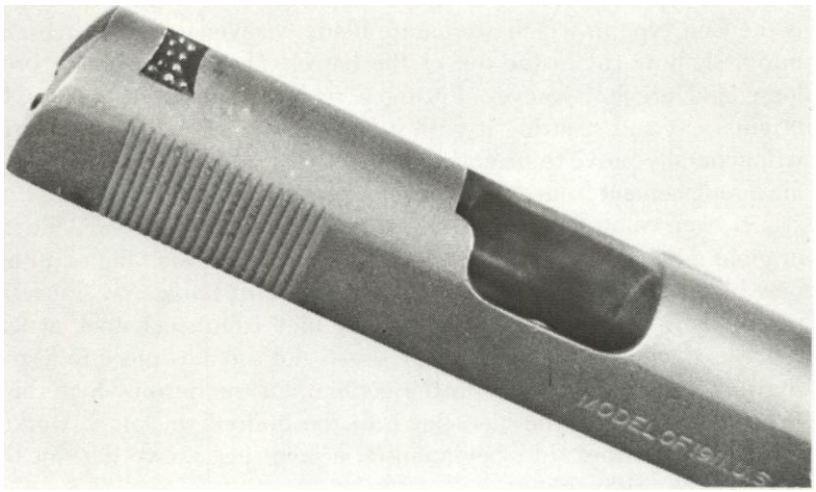
If that sounds like too much trouble, you can simply solder on a piece of 1/16 -inch thick steel to the rear face of the original sight and then cut it to the proper height and width, and notch it.

LOOSE SIGHTS

If you have dovetailed rear sights that are too loose, staking is by far the simplest method of tightening them. If you object to the staking marks, then remove the sight, and use a sharp-pointed punch to raise burrs inside the slide dovetail. Unless the sight is abnormally loose, this will generally tighten it sufficiently; if not, sweat a piece of steel shim stock on the bottom of the rear sight or on the bottom of the slide dovetail and refile to fit.

Loose front sights, particularly those on the Colt/Browning guns, are more difficult to secure. On the Colt ·45, the front sight sits in a groove machined in the top of the slide, and a stud on the bottom of the sight protrudes through a hole in the slide and is riveted from beneath. Once this sight loosens, it is extremely difficult to re-rivet or stake solidly back in place.

The factory does this repair work using a special tool and fixture, and there isn't any way you can get in there with a conventional punch to do the job, except one. That consists of drilling a 3/32 or 1/8-inch hole in the bottom of the slide, directly under the sight, and then using a long punch to reach the end of the sight stud. Even then it's difficult and you are left with an extra hole in the slide. The hole doesn't hurt anything, but many shooters find it objectionable.



When any sight is loose in its dovetail, dimpling the floor of the female slot will tighten the assembly.

The only other way I've gotten a good fix on such a loose sight is to remove the original entirely and then carefully clean out the slot and hole in the slide. Next, I clean the original or a replacement sight, clamp it in place and silver solder it.

Micro Sight Co. (and perhaps other makers as well) offers high replacement fixed sights for the Colt Government model and they are easily installed. However, if you want to use these sights on a Browning or some other big autoloader, you will have to reshape either the sight or slide dovetail to fit the rear sight. Fitting the new, high front sight requires that you duplicate the Colt cuts in the proper position on the slide. This isn't difficult if you have a hand grinder, needle files, and some means of drilling a hole for the stud.

FIXED SIGHT PROBLEMS—REVOLVERS

Correction of fixed revolver sights presents a few more problems. Almost invariably the rear sight is simply a notch machined in the top of the frame. As such, the best you can do with it is reshape it with files and hope for the best. It is not laterally adjustable in any way and this presents some targeting problems that we'll discuss later.

Two types of fixed front sights will be encountered. Most common is the Colt type in which a separate blade is silver-soldered or brazed into a shallow cut in the top of the barrel. These occasionally break loose and are lost forever. Fitting a replacement carefully into the original cut and securing it with a first-class piece of silver soldering will generally prove to be entirely satisfactory, but it's usually easier to file a replacement from a piece of scrap steel than it is to order it.

If you want to change the original sight in any way, file the original down to leave a stud about 3/32 to 1/8 of an inch high and fit a new blade over it, securing it by silver solder or horizontal transverse pins or both. This new blade should be filed from steel stock at least twice as thick as the original blade. First, slot the new piece to fit over the stub and fit it carefully to the contours of the barrel. Once this is done, the sight may be filed down to the desired thickness, working equally from either side, beginning at a point just above the slot that fits over the original.

It is wise not to reduce thickness too much until targeting is done. Modest lateral adjustments can be made in the front sight (remember, the rear sight can't be moved) by filing more off one side than the other. Removing more metal from the right side has the effect of moving the front sight to the left, and thus moving the bullet's strike (in relation to the line of sight) to the right.

A rule to remember: File from the side toward which you want to move the strike of the bullet.

Though relatively little sight correction can be made this way, additional lateral shift can be accomplished in the rear sight by filing the notch wider. Widening the notch to the right has the effect of moving the rear sight to the right, and thus moves the strike of the bullet to the right.

Another rule to remember: Widen the rear sight notch in the direction that you want to move the bullet strike.

So, if you have a fixed-sighted gun that is shooting off to the side, fitting a wider front sight and filing it, and then widening the rear sight notch will usually provide enough adjustment to bring the gun on target. And this procedure doesn't affect the gun's appearance at all.

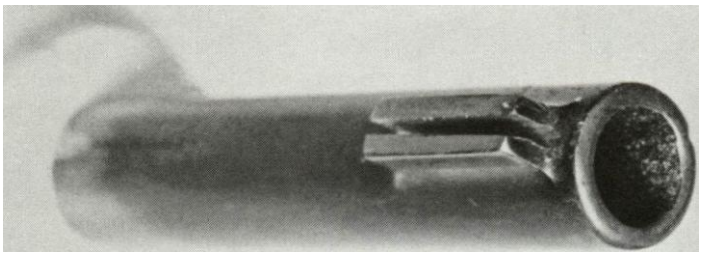
As for targeting a fixed-sight revolver when a new front sight is installed, you simply begin with a too high front blade and file it down until the bullet strikes point of aim. No elevation correction can be made in the existing rear sight. Fortunately, this doesn't present much of a problem, because virtually all revolvers have front sights standing quite high above the barrel. No matter how much need be taken off, there will invariably be enough left to be easily picked up by the eye.

The other type of revolver fixed sights encountered quite frequently is the old style S&W design in which the entire front sight is forged integrally with the barrel. This front sight never comes off; it can't. However, it has a very poor shape in earlier models, being simply a half-circle rounded on all edges and producing very poor definition. It can be vastly improved by filing the rear face to a 45 to 60-degree angle, filing its top flat and square, and then serrating the rear face.

For a replacement blade, the thick, solid base forged on the barrel provides an ideal seat. Simply saw or file the original blade flush with the top of the base and carefully cut a lengthwise vertical slot in the base. If it is known that lateral adjustment will be needed, a portion of it can be estimated and the slot for the new blade laid out accordingly. If the bullet strike must be moved to the right, lay out the slot for the new blade just a little left of center. Make the slot the full thickness of the new blade and cut all the way down even with the top surface of the barrel.

Now it is a simple matter to saw and file the new blade to shape, contour its bottom to fit the top of the barrel, (at least if it will be extending beyond the base) and then secure it with two drill-rod pins driven laterally through the base. No soldering is necessary, and if the blade is blued before installation, the cut surface of the base can be spot blued and no other refinishing will be necessary.

Here again, additional lateral sight adjustment can be made by filing one side or the other of the blade, or even by offsetting the blade the way the British do replacement blades in their big Webley ·455 revolvers.



This is the base of an old-style S&W revolver front sight which has been cut down and slotted lengthwise to accept a replacement blade. The slot may be cut entirely with needle files, or first made with a hacksaw and then trued up and widened with files.

Occasionally you may come across a fixed-sight revolver whose rear sight has either been damaged or ruined by earlier attempts to file it to a new size or shape. If you have access to a first-class heli-arc welder, you can fill up the original notch and then carefully file a new one. Otherwise, the only practical repair is to silver-solder (even soft solder will work) a thin piece of steel to the rear of the original sight surface and then file a new notch in place.

Most modern revolvers have a relief cut behind the rear notch and you can shape a piece of steel to fit in this cut, against the notch- bearing surface, and solder it in place. Older guns, especially Colt Single-Action Army, have no substantial relief cut, and it is necessary to provide one with a hand grinder before installing the new notch plate.

Alternatively, you can trim down a Moto-Tool cut-off wheel and grind a shallow semicircular recess immediately behind the original notch. Then you can solder a thin piece of steel in this new recess and file a new notch in it. Care must be taken to make the cut no larger or deeper than necessary to match the original notch. If the cut is made too deep and wide, the strength of the topstrap may be impaired. This can also be done if you need a slightly higher rear sight.

INSTALLING TARGET OR ADJUSTABLE SIGHTS

Installation of target-type sights on autoloading pistols has become quite popular and a number of shops now specialize in fitting them. Many sights are available and installation methods vary from simply seating the new sights in the original dovetails to extensive modifications of slides.

The simplest installation is that for the MMC Combat Sight. This requires merely that the original sight be drifted out, a small clearance cut be filed on the forward edge of the dovetail, and the new sight drifted into place and staked securely. The standard or so called "high" Micro Sight is also installed in the original Colt Government Model dovetail, but when applied to other models, a new dovetail must be cut.

When a "low" Micro Sight is installed (permitting the use of the original Colt Government front sight), not only must a new and deeper dovetail be cut in the slide, but that portion of the slide rearward of the dovetail must be cut down to provide clearance for the sight leaf. Bo-Mar and occasionally other adjustable target sights also require cutting new dovetails and clearance.

The main problem with these large and relatively heavy target sights is not so much in cutting the dovetails and clearances for their installation, but in securing them solidly so that recoil forces will not cause them to work loose. First of all, dovetails must be carefully fitted so that maximum metal to metal contact is made. This requires careful spotting of the sight base into the cut with lampblack or Prussian blue and maintaining a very snug fit. It should be as tight as possible and still allow the sight to be tapped into place with a brass or fiber drift without deforming it.

Staking is the time-honored method of securing dovetailed sights. Unfortunately, some target sights overlap their dovetail bases so much that there is no place to stake them. Micro helps solve this problem by installing two small screws that run through the base and bind against the slide's dovetail. This helps, but not a great deal. For this sight, I prefer to drill 1/16-inch deep holes in the slide matching the screw holes in the sight base and then use longer screws which will jam tightly into these holes. So, instead of just clamping, the screws also become pins that engage the slide. At other times, I have drilled completely through a slide and countersunk the holes so that screws could be inserted from the underside and turned tightly into the sight base.

An alternative is simply to tin the bottom of the sight base and the bottom of the slide dovetail and sweat the two solidly together. This is generally advisable where no secondary means of securing the sight in the dovetail is available. Remember, the larger and heavier the sight assembly, the more likely it is to shake loose and shift in its dovetail.

Some models of Colt target sights, particularly those found on the Gold Cup ·45 autoloaders, are prone to shearing or breakage of the pin holding the sight leaf to the sight base. This is due principally to the use of a cheap roll pin (which looks like the dickens on a $200-plus target gun!). If one of these guns is intended to be shot a good deal, I always replace the roll pin with a piece of hardened drill rod.

Hardened drill rod should also be used when the factory pin breaks. I recall one instance where a shooter was hit squarely between the eyes, suffering a deep laceration, because the sight leaf flew off his gun in recoil when a roll pin failed.

There is one target sight installation on autoloaders which has recently found much favor. It involves inletting the S&W K-38 (or similar) revolver sight into the slide. This is not a simple job, and many shops charge from $30 to $50 to do it. The first step calls for welding up the original sight dovetail (the preferred method), or peening in a tight fitting dovetail blank; either must then be filed and polished to match the slide's contours. Next, machining cuts must be made to accept the S&W sight. The first cut runs the full length of the top, from the ejection port backward, just wide enough and deep enough to accommodate the elongated S&W spring-tempered sight base.

This slot is easily cut if you have a milling machine and an assortment of small cutters, but lacking that, there is no reason that you cannot lay it out, carefully centered from side to side, and file it to shape. Now, a notch must be cut in the upper rear of the slide to fit the rear of the sight. This can be cut as quickly with a file and hacksaw as on a milling machine.

In the original S&W installation, a slot is undercut in the front face of this notch to accept a threaded stud over which the windage screw of the sight engages. This can be duplicated, but requires a fragile, special sized cutter and milling machine. It isn't worth all that much trouble. Instead, position the rear sight in the slide and mark, drill, and tap the hole for the sight-base attachment screw. Then, with the sight base screwed securely in its new slot, depress the rear of the sight all the way, and carefully center-punch the top of the slide through the elevation screw hole. Drill and tap this new hole taking care not to raise burrs in the firing pin hole beneath it. Then shorten a fillister-head screw to fit down through the elevation screw hole in the sight and turn it into this new threaded hole.

With hand grinder or needle files, duplicate the click notches of the original screw in the head of this new screw and then thin its head down so that it is flush with the top of the sight base (this may also require reducing the diameter of the head and deepening the screw slot).

Other thread pitches may be used, but the one given here duplicates the original S&W installation and the sight-change value of each click. If you use a different pitch, then the values of the K-38 elevation clicks may change.

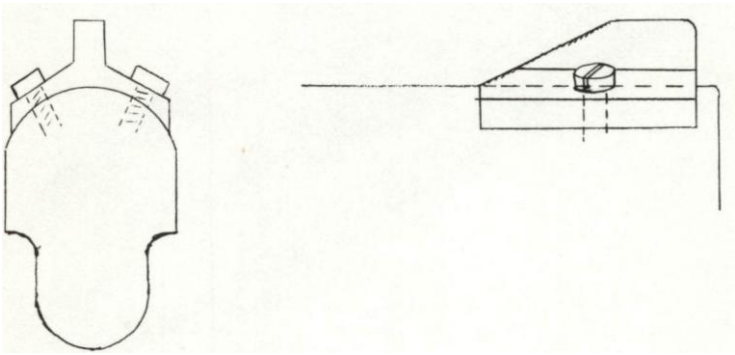
Incidentally, you're not limited to using S&W K-38 sights. A smaller version of this sight is used on the S&W Kit Gun series, and a slightly larger version on the N-frame S&W Magnums. In addition, a very similar and equally useful sight, which costs much less, is used on the Astra and some other foreign revolvers. All may be fitted to selfloader slides as described.

The S&W K-series and similar target sights may also be fitted to various fixed-sight revolvers the same way. You must use extreme caution, however, in cutting the clearance notch for the rear of the sight. If this notch is cut too far forward, it will greatly reduce the strength of the junction of the topstrap and the recoil shield. The notch should be made as small as possible, even though the rear of the sight overhangs the recoil shield more than it does in the factory installation. In some instances this will require reshaping the hammer spur for clearance.

There are a few autoloaders upon which target sight installations are difficult. The S&W M39 is one, and while it is possible to weld up the original sight cut and fit almost any available sight, the job is quite extensive. The magazine safety must first be removed, after which extreme care must be used while welding to insure that the weld does not intrude through the magazine-safety hole and interfere with functioning. This is best accomplished by pressing a sheet-steel disc tightly into the top of the safety recess before welding. It is much simpler to obtain the MMC M39/M59 Combat Sight and simply snap it into place. It is completely interchangeable with the original rear sight and compatible with the existing front sight.

Several manufacturers currently offer complete sight/rib combination units which may be installed directly on top of an autoloader's slide. Most prominent among these are the Bo-Mar units which are installed by drilling and tapping holes in the slide, and securing the rib with countersunk screws.

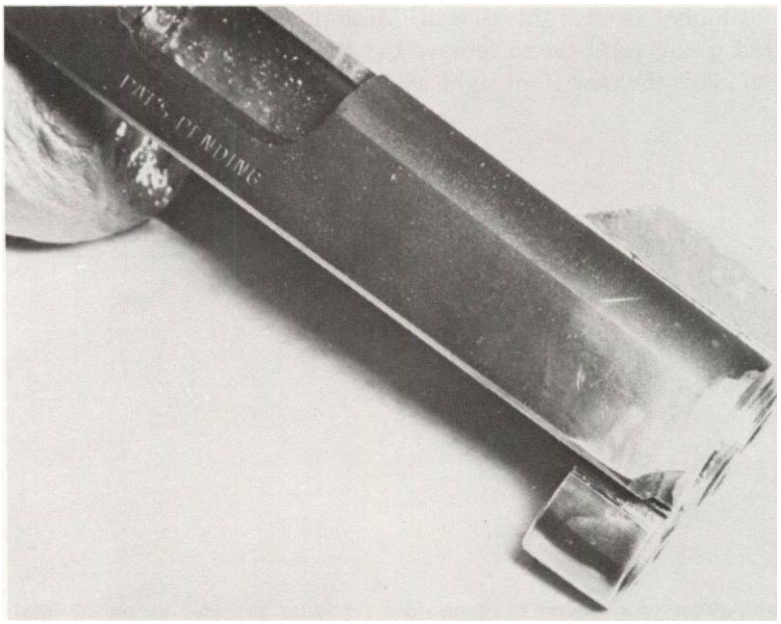
More often than not, installing a target-type rear sight requires a new and higher front sight as well. Most rib units include the front sight, but if not, you have to remove the old sight and fit a new one. I prefer to make the new front sight with a larger joining surface than is offered by any of the commercial models. Our sketches show how a typical sight and its wide base make installation easy and recoil-resistant. For moderate loads, it may be attached either by screws, as shown, or by sweating it in place. I prefer both.



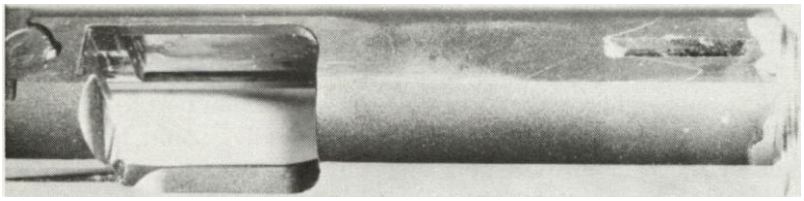
This pattern of replacement front sight for autos provides maximum joint surface and so is unlikely to ever shoot loose. Screws shown are turned in very tight during soldering to tighten the joint, then when cool, the heads are cut off and polished flush with the sight base.

Drilling holes at an angle to match both slide and sight can be tricky, so shape the new sight as shown, carefully align it, and soft- solder it in place. Then drill the No. 31 holes through both sight and slide simultaneously, tap through both, run a long 6 x 48 screw in flush with the inside of the slide, and peen over its inner end. Finish by filing the base of the sight to shape, cutting off the screw head in the process, and peen the outer end of the screw as well. If this is done properly, you'll have a front sight installation that will last forever, unless you hit it with a two-pound hammer.

If you insist on a less bulky front sight, file a blade out of 1/8-inch steel stock, leaving a substantial tenon on its bottom as shown. Drill a row of overlapping 3/32-inch holes centered along the top of the slide, and open them up, using needle files, into a single slot that will fit the base tenon of the sight very closely. The sight may then be silver- soldered (preferred) or soft-soldered in place, and any protruding tenon ground off inside the slide. If additional security is desired, a couple of 1/32-inch drill-rod pins may be ran through the slide and sight tenon.



Rough-shaped replacement front sight is seated part way into slot cut in top of slide.



This shortened S&W slide has been prepared for fitting a new front sight by drilling an overlapping row of small holes, then filing those holes into a slot that will accept the tenon on the base of the sight.

ADDING A RIB

Perhaps you want to add a solid or ventilated rib to your favorite autoloader. This isn't as difficult as one might think, and while a milling machine and proper cutters is a big help in such an operation, it may be done by hand with nothing more than a hacksaw and files, if you can afford the time.

Begin by selecting a piece of steel bar stock of approximately the width and height required. Cut it to the length of the slide and decide whether you want it to be solid or ventilated. The ventilated style is much easier to fit, but when the extra work of cutting the vents is considered, it's actually more total work... so pay your money and take your choice.

The simplest way of fitting a solid rib is to file, grind, or machine the top of the slide flat along its full length. On the Colt Government Model, this flat should be about 1/2-inch wide, and of uniform width.

Carefully wire or clamp your rib stock in place and drill holes through both rib and slide. Take care not to drill holes through the locking surfaces, and don't run the holes behind the ejection port into other working parts. Remove the rib and drill and counterbore and tap the holes to accept the screws. Once all this has been done, you may file or grind the rib to the exact profile you wish (a slight taper running towards the muzzle is attractive) and install whatever sights you want.

The simplest method of installing a front sight is merely to slot the rib vertically, slip in the front sight, and pin it horizontally with two 1/16-inch drill-rod pins. At the rear, one of the best but most time consuming installations is the S&W target-revolver sight. Any other target sight may be fitted by duplicating the cuts in its base at the rear of your rib, followed by drilling appropriate holes.

Next, saw and file a clearance around the ejection port for the gun to function correctly. This clearance cut generally should follow the outline of the ejection port and angle upward at about 45 degrees. Each gun's ejection pattern varies considerably, so cut away about half of what you think will be necessary and test-fire the gun. If it works, you've saved a lot of trouble. If it doesn't, you'll have to keep filing.

While simple screw attachment methods work well with most calibers, high intensity or heavy recoiling loads may require either additional screws or soldering. Let your conscience be your guide.

Some people don't like to flatten the top of the slide, thinking that someday they might want to remove the rib, plug the screw holes, and have the gun look as it did before. In that case the earlier instructions apply, except that you must slowly and laboriously file the underside of the rib blank to match the curvature of the slide. This job can be speeded by using a large diameter sanding drum or mounted wheel in your hand grinder, along with a large half-round file with a radius slightly less than that of the top of the slide. With the rib blank inverted and secured in a vise, it's fairly easy to make repeated passes down the center with the hand grinder and then clean up that rough- cut groove with the file.

Final fitting can be done by applying rubber cement to the top of the slide and laying abrasive cloth or paper over it, followed by working the rib back and forth over the paper to obtain an exact match with the slide. To do this properly and wind up with a close fit, begin with a relatively coarse abrasive and finish up with something like 400 grit.

If a ventilated rib is desired, first lay out the vents on both sides of the blank and outline them with hacksaw cuts and rows of small holes done on your drill press. The bulk of the surplus may then be knocked out with a small chisel after which the vents are trued up with assorted files. With that done, it is much easier to round the underside of the rib to fit the slide.

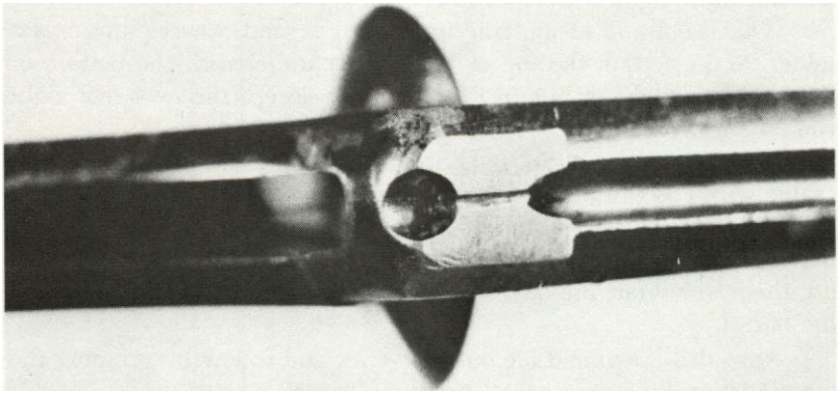
An alternative method of attachment is to cut the vents and file shallow notches across the top of the slide that match each rib support. If this is done carefully, the supports will fit tightly into notches, providing a very workmanlike job. Final rib attachment may be either by screws or solder or both.

Once a rib and sights are installed, the rib should be finished to match or contrast with the rest of the gun. A matte blue or black finish is best, and is most easily produced before final attachment by having it sandblasted, then bluing it yourself. The finished job will attract more attention if the entire top surface of the rib is stippled, serrated, or checkered.

Many pistoleros, especially police officers, like to carry bright- plated guns, but find their sighting qualities poor because of glare. This can be corrected, while retaining the shiny gun, by carefully fitting a low rib and sights, then bluing or blacking the rib separately, then attaching it permanently. This calls for screw-only attachment, since soldering heat would spoil the plating on the slide. Bo-Mar, incidentally, makes its matte black "Combat Rib" for Colt, S&W, and Browning autoloaders. It can be quickly fitted to nickeled or chromed guns to provide glare free sighting.

Fitting adjustable target sights to revolvers is no more difficult than autos, but there are very few suitable sights available. The simplest and most practical setup is the flat base Micro made for M1917 revolvers. One simply files a short flat at the upper rear of the topstrap, making certain it is square with the frame sides and parallels the barrel. Then the clean-based sight is carefully aligned and epoxied on the flat. When the joint is cured, holes are spotted and drilled through the holes in the base. After tapping, screws are turned in, and any protrusion beneath the top strap is ground off.

Where recoil is light, the epoxy may then be removed and the screws alone used to secure the sight. For heavier calibers, the sight should also be sweat-soldered in place, turning up the screws tightly while the solder is molten.



The flat-base revolver model target sight offered by Micro for revolvers is easily installed by filing this flat, then drilling and tapping two holes.

A rudimentary rear sight adjustable for windage can be fitted by filing a shallow dovetail at the rear of the topstrap, then shaping a matching rear sight leaf to fit in it. Take care here that the dovetail is not cut so deep as to weaken the topstrap excessively.

Installation of any adjustable rear sight on a revolver requires a higher (and usually wider) front sight. Make your own, as already described, or purchase replacements from Micro. The latter is usually slotted to fit over the cut down original sight and is pinned in place. Nothing difficult there, but where heavy recoiling calibers are involved, addition of solder to the joint is desirable.

A rib may be fitted to a revolver, but the job is more difficult than with an auto. The process is essentially the same, but the compound curves of the barrel and front of the frame make the job very trying. In fact, I'd venture to say that a solid rib is virtually an impossible task for an amateur to accomplish properly.

A ventilated rib, however, isn't quite so bad. Lay it out with a scribe on the side of the rib stock you've chosen, as shown in the drawings. Note that the rib is in two pieces, one for frame and one for barrel. Fitting is much simpler that way.

Begin by removing the barrel from the stripped frame. File and saw the rear section to approximate shape first, then with hand grinder and files, shape its underside to fit closely over the topstrap and barrel ring of the frame. Drill, tap, and counterbore the screw holes, then apply low-temp silver fusion solder between rib and strap, and assemble with screws and clamps. Heat to flow solder and while the solder is fluid, tighten screws and clamps tight.

When cool and clean, true up all edges, and remove any excess solder. Make certain the top of the rib is parallel with the bottom of the topstrap. Make or complete the cuts to accept the new rear sight you'll be using.

Now, screw the barrel back in, and clamp a length of bar stock (same width as the rib is to be) to the top of the frame rib. Measure downward from the bottom of this bar at 1/2-inch intervals to the barrel. Transfer these measurements to the side of your rib stock, and use them to lay out the curve of the bottom edge of the rib to match the barrel.

Now, drill, saw, and file out the vents, and follow by grinding the remainder to the proper barrel-matching curve.

Next, file or grind grooves in the underside of each rib leg to fit over the barrel, at the same time, slot the front of the rib to fit over the original front sight stub. Also, cut the slot for whatever new front sight you'll be using.

Continue this process, spotting rib to barrel every few file strokes, until the rib seats tightly on the barrel, especially at its outer edges and muzzle, and its top is level with the frame rib. With the rib clamped tightly to the barrel, drill the crosspin holes up front, and drill and tap the shallow hole for attachment at the rear of the barrel.

Mark around all joining surfaces on the barrel, then remove the rib. Remove finish in all joint areas, then apply low-temp silver fusion solder on all joint areas. Assemble rib to barrel with pins and the one screw, and add two or three small clamps or tight wire wrappings. Apply heat to flow solder and tighten the screw and clamps.

When cool, get rid of the clamps and wire, remove excess solder, and clean up the entire job. Your fancy ventilated rib is now ready for polishing, bluing, and installation of sights.

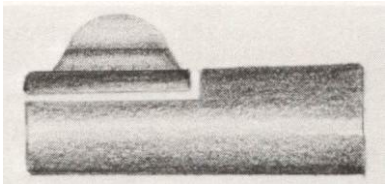
These are the basic iron sight jobs you might decide to do, or be called upon to do. Doubtless others will come up, but if you can handle these, you can handle anything else that comes up.

INSTALLING SCOPE SIGHTS

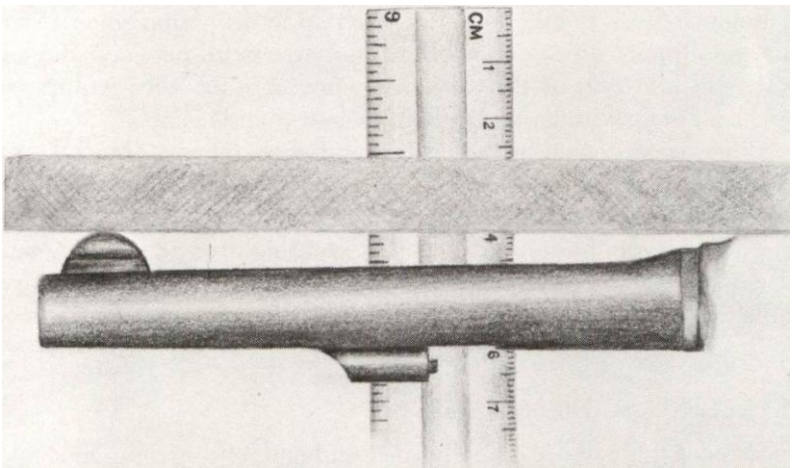
Scope sights are occasionally used on handguns, mainly on singleshot models such as the T/C Contender and on magnum revolvers. The Contender presents no problem inasmuch as it is supplied drilled and tapped for standard mounts which are made to fit it. Installation becomes simply a job of setting the mount on the gun and turning the screws down tight. This done, all contact surfaces and threads should be degreased, and Loc-Tite should be applied. Because of their light weight, handguns place very heavy acceleration loads on the mount and screws—which means that assembly must be as secure as possible.

Revolvers are another matter. The typical mounting job will be on an N-frame Smith & Wesson in ·357 or ·44 Magnum caliber. The latter, especially, recoils heavily enough to shear mounting screws in short order.

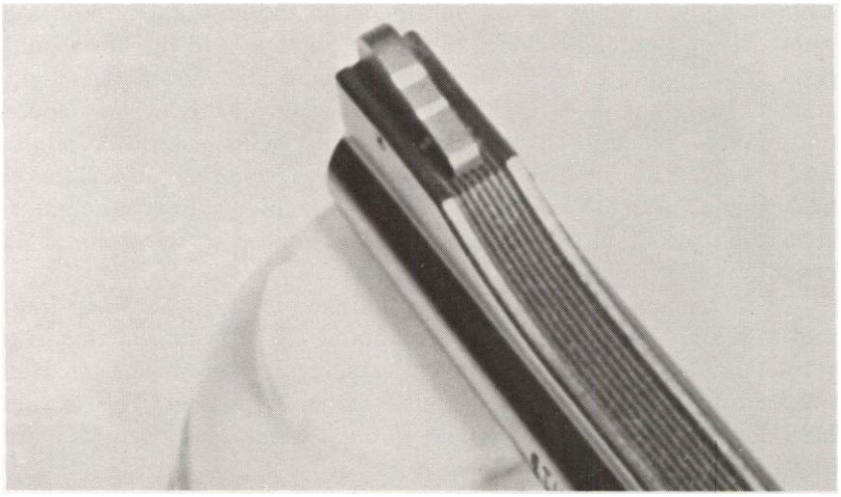
A few mount makers offer bases designed to fit the S&W topstrap, and with a lug to engage the sight cutout at the rear and function as a recoil lug. Unfortunately, drilling the necessary screw holes in the topstrap will weaken it by as much as 25 to 30 percent. This can be held down by using only a couple of small screws, but then they are likely to shear off.



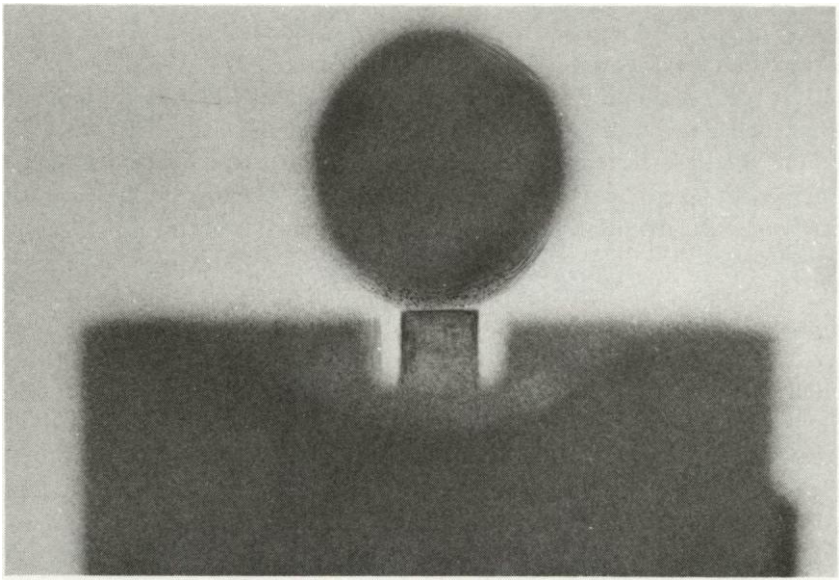
When shortening revolvers, the original front sight may be cut away as shown to make a replacement.



Time and effort may be saved if the height of a replacement front sight is determined in this fashion before a revolver barrel is shortened; then make the new sight 1/32 to 1/16″ higher to allow for targeting.



If one wishes to use a single height of front sight for various ranges, white lines may be inlaid across its rear face to provide reference points for longer-range shooting.



When front and rear sights are properly shaped and dimensioned, this is what the shooter should see: sharp front-sight image combined with out-of-focus rear sight and target.

If you must mount on the topstrap, carefully hand-fit the base to the strap with file and scraper until very close contact is obtained. Then, clamp or epoxy the carefully aligned base in place and center- punch the necessary screw holes through it into the topstrap. Drill and tap these holes, then screw the mount temporarily in place to recheck alignment. If all is well (and it better be) then remove and clean all surfaces thoroughly. If the base is aluminum, apply epoxy under it, and Loc-Tite on the screws and assemble tightly. If the base is steel, polish and tin both strap and base, then screw together. Apply heat to flow the solder, and tighten the screws further while the solder is molten. Cool, clean off surplus solder, touch up the bluing, and you have as secure a topstrap installation as possible. But I prefer to install the mount on the barrel rib. This avoids weakening the topstrap, and allows the use of a couple extra screws to insure against recoil damage.

The best rib job is done by using a flat mount base of Buehler or Redfield type. Carefully mark the base location on the rib, then file the joining surface perfectly flat, down to the point where the flat will be full rib width. Carefully match the front shoulder that is formed to the front of the base so it will function as a recoil shoulder. Spot the base to full contact with the flat.

Clamp the base in place, tightly up against the shoulder, and center-punch the barrel through the existing holes. Then carefully drill and tap those holes, making certain they do not approach closer than ·060″ to the bore surface. Use bottoming drills and taps to insure full threads all the way to the bottom of the holes.

Unless there are at least three screw holes provided in the base, at least one more must be added; I prefer a total of four. To do this, screw the base in place, then center-punch an extra hole on it. Drill these with a screw-size drill to spot the barrel. Remove the base, finish its hole, then drill and tap the marked hole in the barrel just like the others.

Three or four hardened screws, plus the recoil shoulder, will hold most scopes solid on even a ·44 Magnum. However, you can add a bit of insurance. To do so, screw the base tightly in place, then drill a 1/8- inch hole through base and barrel from side to side so that half the hole is in the base and half in the barrel. Ream this hole for a tight straight or tapered pin (hardened) and tap the pin in place. When tightly fitted in this fashion, the pin takes recoil loads off the screws and they positively will not shear, unless you let them work loose. Finish this mount job by using Loc-Tite and drawing the screws up very tight.

This makes a permanent installation, and the altered rib will look awful if the mount is ever removed, but you won't have to worry about the scope jumping off. Not many autoloaders are fitted with scopes. A scope can be installed on the slide of a Browning-type gun, but the additional mass will interfere with functioning. If this type of installation is attempted, it should be with the smallest and lightest scope and mount available, such as the Hutson combination. Even then, expect functioning problems unless the slide is lightened to compensate for the added scope/mount weight.

Bushnell once made a simple auto mount for the Colt Government Model, and it is still available. It is a single piece of metal that replaces the left grip, held by the grip screws. Its upper end bends outward to clear the slide, then arches back in over the slide and is formed into a dovetail. The standard Bushnell base then fits over this dovetail, placing the scope over the slide but attached to the frame. Installing this mount is ridiculously simple. Just remove the left grip, replace it with the mount, then clamp the scope in place.

Any other handgun scope problem must be played by ear, modifying rifle mounts and rings to suit the job.

CHAPTER 10 - Double-Action Revolver Tuning and Timing

There was a time when a new DA revolver popped right out of its factory box with a sweet, smooth rolling, delightful DA trigger pull. Anyone much my side of forty will doubtless remember the finger- flicking action of those lovely pre-1950 Smith & Wessons. Anyone fortunate to lay hold of one of those closely fitted, long-action guns made before WW II usually wouldn't swap it for two of today's factory bests. From an engineering standpoint the later short-action guns may be superior, but they don't have the smoothness, feel, and speed of the old long and limber jobs.

Not only are the later guns of less desirable design for smoothest double-action work, but they lack the fine hand fitting and precise workmanship of those days long gone. Times and economic conditions, along with production technology, have changed, and it really isn't feasible to build guns the way they did some forty years ago. That part isn't the manufacturer's fault.

Even so, those changes don't excuse the horrible roughness in the lockwork of many current DA revolvers. Some of those produced in the past few years came out of the box feeling as if their innards contained a handful of gravel. I've even seen a goodly number that either wouldn't fire the first shot as they were purchased, or crapped out during the first couple boxes of ammunition. Just yesterday 'a brand-new, latest-model specimen, fresh from the factory and unfired, arrived at my desk, very badly out of time.

All of which leads up to the simple and inescapable fact that many a brand-new, much less used, modern DA sixgun can benefit immensely from a little careful tuning, at least they will if you want anything other than thumb-cocking, slow-fire performance. For an example, let's start with a popular standard model, say, the Smith & Wesson M10, M&P model. Except for minor variations of profile and size, its important innards are identical to all S&W DA wheelguns made over the past twenty years.

TYPICAL TUNING PROCEDURES

Here are the areas where problems can exist to cause rough and heavy DA trigger pull.

1) Roughness on double-action fly and trigger surface engaging it. These two parts slide on each other under very high contact pressures throughout the entire DA pull. Roughness or tightness of the fly attachment to the hammer can also be a lesser problem.

2) Hammer wobble on its pivot stud and side to side play in the frame add to the problem. Further, if the hammer rubs against the frame or side plate during any of its rearward travel, friction loads are increased.

3) Friction between the inner part of the cylinder latch and the back of the hammer will add weight to the pull, and perhaps some roughness.

4) Roughness and friction between the rebound slide and frame, side plate, trigger, hammer foot, and rebound spring stud will add weight and roughness. So will excessive contact between the rebound spring and slide.

5) Anything interfering with freedom of trigger movement will add to the problem. That includes hand friction in the frame, roughness between trigger and bolt, friction against the frame or side plate, etc.

6) Timing is also critical. If the bolt does not drop clear of the cylinder locking notch before the hand begins pressure on the ratchet, there will be a hard spot at the very beginning of the DA pull.

7) If headspace is under minimum, the case heads may drag on the recoil shield and increase the pull. Likewise, if excessive end play or a too narrow barrel/cylinder gap exists, friction may load down the pull. Burrs on the recoil shield or around the firing pin hole may drag on case

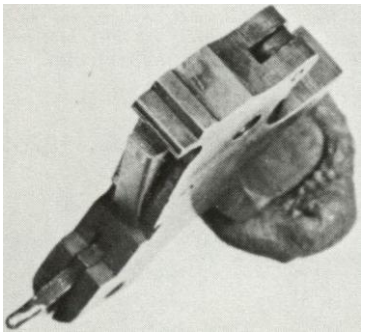
heads and add to the pull.

8) If the cylinder does not rotate freely on the crane, the pull will be heavier than it should.

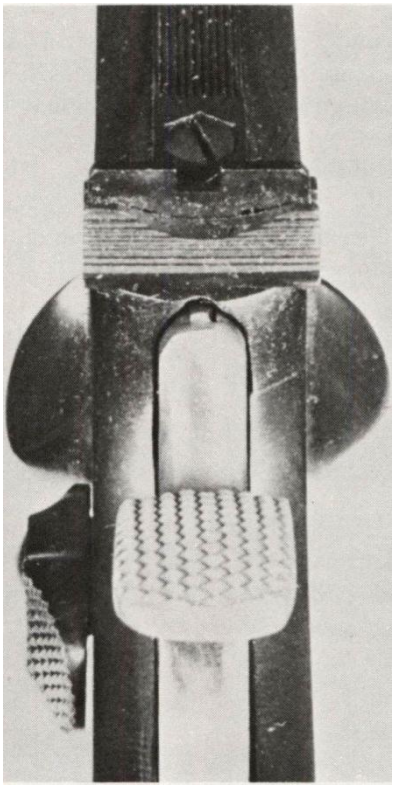
9) If the mainspring is abnormally heavy, it will add to the finger's load.

A rough gun may contain only one or two of these problems, or it may contain most of them. The best thing to do is to take off the side plate and start at the beginning of the following nine-point numbered list.

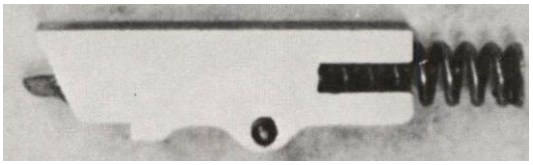
1) Smoke the undersurface of the DA fly and upper surface of the trigger nose, then move the parts through one DA cycle and look at the contact areas outlined in the rubbed-off spot on both areas. Polish contact areas smooth; don't try to rush the job with a coarse stone, file, or grinder. Smoke and recheck periodically to make certain that the surfaces remain parallel. Take care not to change the curve of the trigger nose, but on the late DA fly of angular shape, it's a good idea to round off the edge of the bevel.



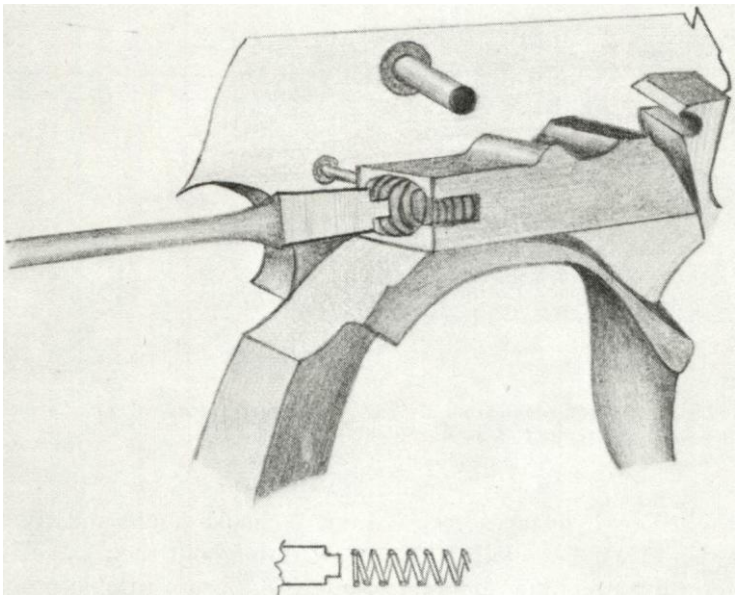
Note underside of DA fly, and underside of hammer foot, where portions of trigger must bear in DA functioning; these areas must be polished especially smooth. Note also the very narrow and shallow full-cock notch.



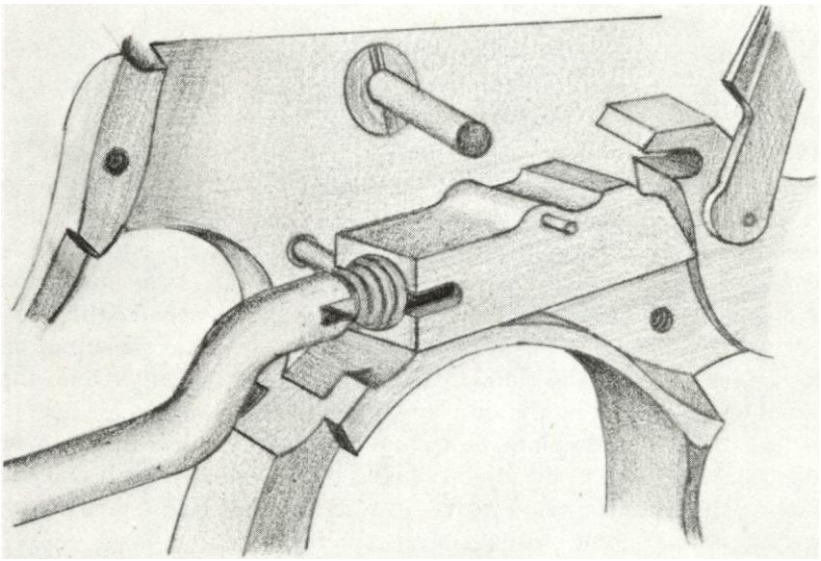
The hammer should be centrally aligned in its slot in the frame, equal distance from both sides. Clearance may be checked with feeler gauges, and clearance evened out by Teflon shims over hammer stud.



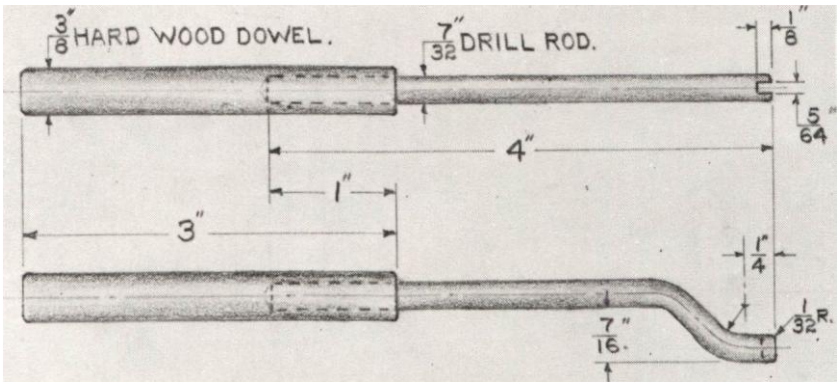
The Smith & Wesson rebound slide and spring are important to smooth and easy double-action work. The slide itself must be polished quite smooth, and the spring must not bind inside the slide, nor the slide on the stud supporting it.



Compressing spring to remove rebound slide of S&W design can be tricky; a screwdriver shaped as shown simplifies the job.



A more convenient method of removing S&W rebound slide is this specially- made tool, made as separately illustrated.



This simple tool, made from drill rod and a piece of dowel, greatly facilitates removal and replacement of S&W rebound slides.

When both surfaces appear smooth, smoke again and try them; soot should wipe off both parts evenly throughout their travel. Don't overdo this; a few low spots remaining won't cause trouble providing, say, three-fourths of the surface is level and smooth. If too much is taken off, you'll cut away the hard surface skin, exposing faster wearing, soft metal beneath. That, of course, makes rehardening necessary.

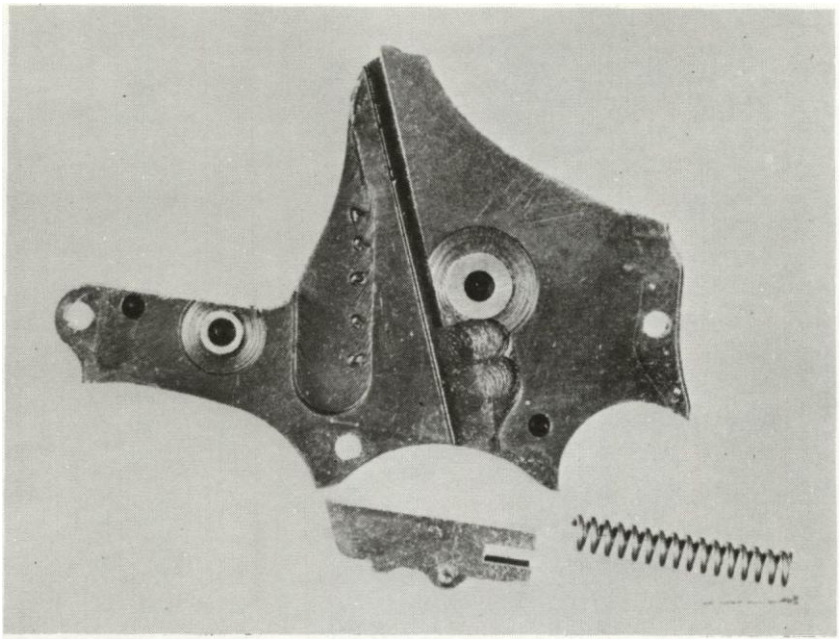
If the fly doesn’t move freely through its full travel under finger pressure, remove it and dress off conflicting burrs.

2) Hammer wobble is corrected simplest by building up the stud on which it rotates by brush-plating with chrome or nickel, then lapping the hammer to a smooth fit. Or, you may elect to install a new stud.

Smoke both sides of the hammer and go through one DA cycle to learn if it is rubbing on the frame or side plate. With scraper or files, remove any frame or side plate burrs that are rubbing, then check hammer for side play. If any exists, fit thin (·001- ·003″) steel or Teflon shims on both sides of the hammer, over the stud to center the hammer in the frame cut. Use a feeler gauge to insure the same gap on both sides, and cut the shims like small washers, no larger than the raised boss surrounding the stud hole in the hammer.

3) With the side plate off and cylinder closed, move the hammer fully back. If there is any contact between the cylinder latch and the back of the hammer, grind or file away interfering burrs. Finish with at least ·005″ clearance throughout hammer travel.

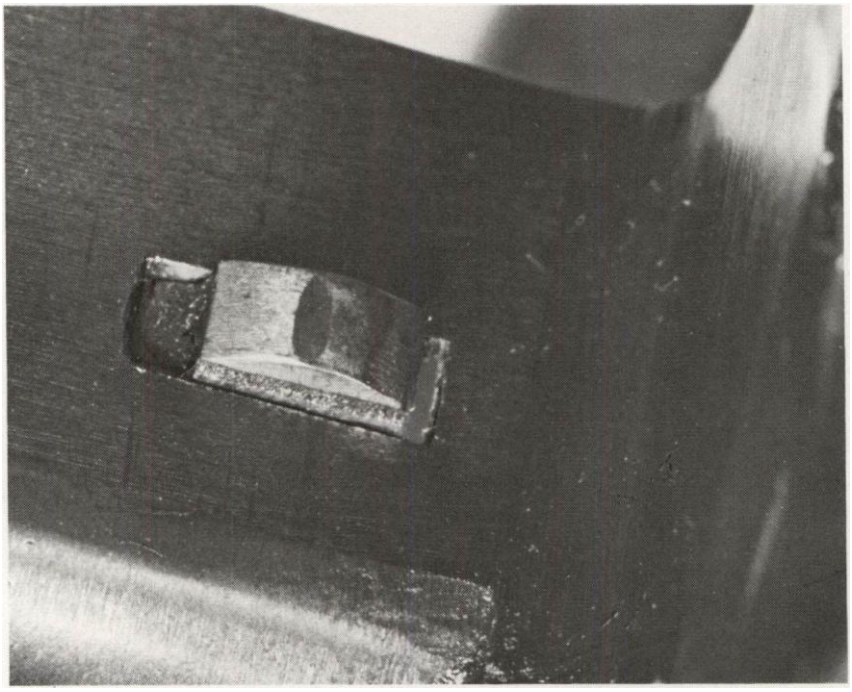
4) Strip the gun and examine all rubbing surfaces of the rebound slide and matching frame and side plate areas. Smoke if necessary. If rough, polish carefully, but do not remove any more metal than necessary. Check to make certain the stud passes freely through the slot in the slide during its entire travel. Remove any burrs on the edges of the slot, and try the spring in the hole to ascertain that it doesn’t bind at any point. If tool marks are prominent in the hole, polish with #600 abrasive cloth around a small rod chucked in an electric drill. Examine the hammer foot and the hump it contacts on the rebound slide, and polish mirror-smooth. Finish by shortening the rebound spring by one coil.



The inside of the side plate must be smooth and free of burrs which might interfere with smooth parts movement; note the slightly raised circular bosses which serve to prevent hammer and trigger from contacting the side plate.

5) Correct trigger interference, wobble, and centering as was done with the hammer.

6) Polish off any roughness where forward trigger extension bears down on the bolt. Only after this, check to see if the bolt is pulled completely clear of the cylinder before the hand begins to rotate the cylinder. If not, carefully stone down the top of bolt until it clears. Barely stone off sharp edges of the sides of the bolt to the depth it enters the cylinder notches. Retime if necessary as outlined elsewhere.

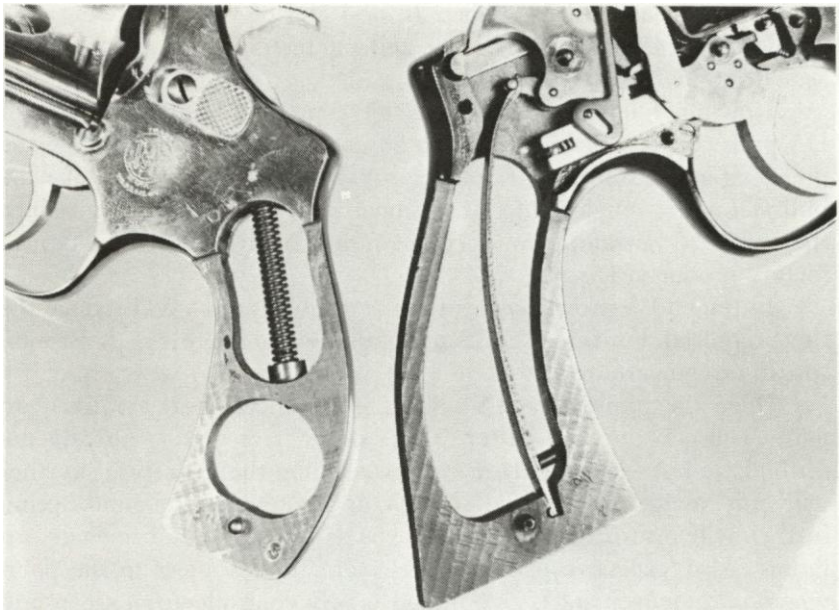


S&W bolt protrudes through close-fitting rectangular hole in frame; may be shifted sideward to correct alignment by moving hole laterally. Note top of this bolt has been stoned down to prevent dragging on cylinder.

7) Check headspace with feeler gauges over a number of different factory-loaded cartridges right at firing pin bushing. If any burrs exist around firing pin hole, stone them off first. There should be at least ·006″ clearance over the thickest-rim cartridges you have. If headspace is excessive, refit the gas ring, then regulate the barrel/cylinder gap to ·006″.

8) When clean and properly lubricated, the cylinder should spin freely on the crane under light finger pressure. If not, look for burrs or bright friction spots on the cylinder axis, then polish smooth. Drag here can also be caused by the extractor rod rubbing on the barrel lug or its hole in the crane, or by a bent center pin or extractor rod.

9) Make certain first that the mainspring seats properly in the frame and does not rub on grips or inside the frame or the side plate. Pull weight can be reduced by backing out the strain screw slightly. This poses the problem of misfires which can be avoided by backing out the screw until DA fire produces at least one misfire in 50 rounds, then turning the screw back in one-half of the distance it was backed out. This halfway screw setting will produce the lightest pull compatible with one hundred percent reliable ignition.



At right is the old-style S&W leaf mainspring with its tension-regulating “strain screw” at the bottom front of the butt; at left is the more modern coil-mainspring. Lightening the coil type is done by clipping off one or one-half coil at a time, while the leaf spring requires very careful reshaping and polishing.

Smoothness of spring action may be increased by polishing the spring lengthwise on a felt wheel charged with very fine compound. Do not file or grind or remove metal, just polish smooth lengthwise only. If the spring is still too stiff, its power may be decreased by grinding or filing it narrower from the edges only. The reduction must not exceed twenty percent of the width at any point and must be uniform on both sides from root to tip, following the original taper. The cut surface should then be polished smooth to eliminate any surface defects that might function as stress raisers to cause an eventual failure.

When all this is done, scrub every part thoroughly in solvent to remove any grit, filings, chips or dirt. Use compressed air, if available, to blow out all holes and recesses.

Assemble the gun carefully, applying sparingly a molybdenum-disulfide lubricant such as Moly-D to all pins and studs, and to all rubbing and bearing surfaces. Cinch up the side plate and rapidly dry-cycle the gun at least 250 times. By the end of the dry-cycling, you should discover a much smoother and lighter pull than the gun possessed originally.

How much improvement is difficult to predict. Actual reduction of DA pull weight may be only 15 to 20 percent, but if you've done the polishing and fitting well, the much greater smoothness will make the pull feel much, much lighter. The smoothness will significantly reduce the awkward muzzle whip so common and frustrating with a typical factory produced DA pull.

In the end, a properly smoothed and tuned action will reduce the time required for three-shot bursts, and will reduce the horizontal spread of your groups.

Once the improvement above is experienced, you are likely to figure you can do even better. That's okay, if the limits already described are not exceeded. However, weakening the mainspring further will only invite misfires. To shorten or lighten the rebound spring further will insure that eventually you'll experience a trigger-return failure. Also, excessive polishing will increase clearances to the point where parts movement is sloppy and poorly controlled, not clean and crisp as it must be for best functioning.

Here are a few other things which may be done to improve feel and handling. Grinding the serrations off the trigger and polishing it glass-smooth will make it feel better. Your trigger finger can then slide smoothly over it as the pull progresses. This improves DA control and reduces side-flip. For some individuals a wider, target-type trigger (also polished smooth) will perform better, especially if the surface is angled rearward slightly to accommodate the angle of the finger more closely.

Of course, replacement stocks designed for DA work must be added if the best results are to be obtained. In fact, proper new stocks, such as the Herrett Shooting Ace pattern, should be the very first change made. The factory stocks should be thrown away and replaced as soon as the gun is taken from the box, before even firing the first shot. With few exceptions factory stocks are unsuitable for good DA work, especially so in the smaller frame sizes.

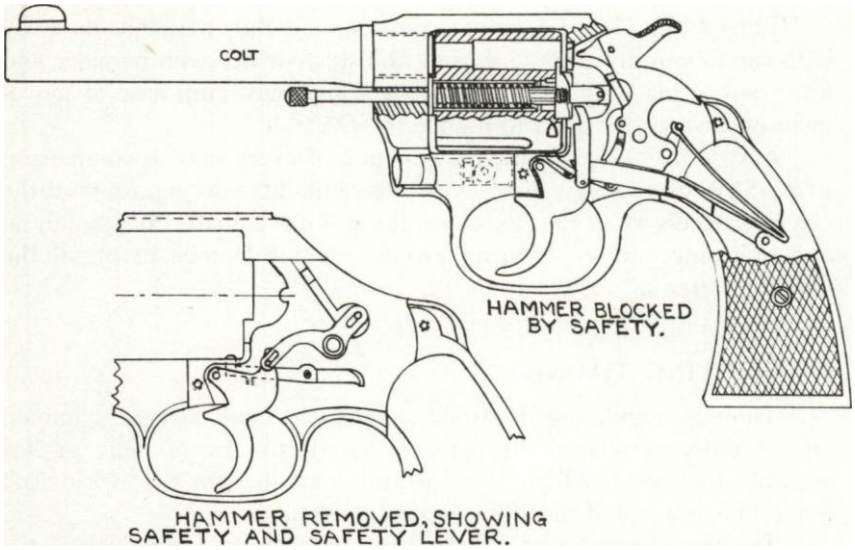
Though not often worth the effort, enlargement or alteration of the trigger guard is sometimes worthwhile. For very large hands or long fingers, the guard may be bulged forward and down to make more room. This may be done by cutting, bending and welding, or by forging over a mandrel, as described elsewhere.

The front part of the guard (from trigger tip at rest, around and up to the frame) may be cut partially away to increase finger clearance. This area should not be cut completely away, for this will leave the weak remainder unsupported and easily bent upwards to jam the trigger. Only a slight impact, easily incurred during a scuffle, might bend the guard and jam the trigger fatally, so the guard is best not cut completely.

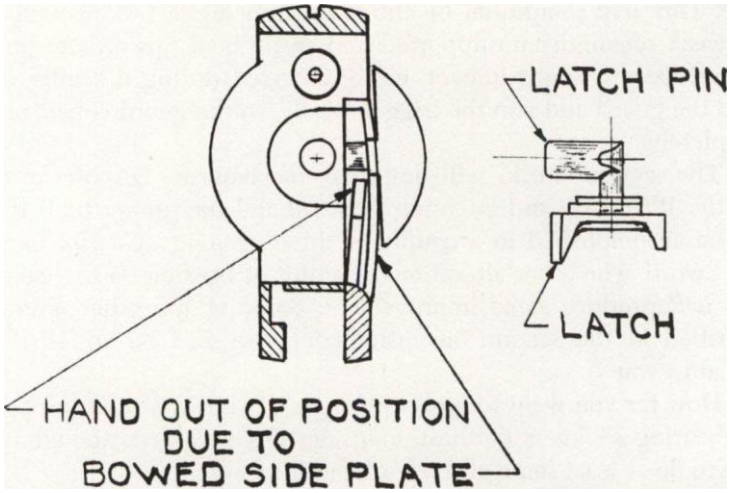
The action work will improve mechanical DA performance greatly. With care and attention to detail and the proper tools the job can be accomplished in a couple or three evenings. Go slowly is the watchword. The other alterations are a bit of frosting on the cake, but they will produce some improvement. Some of the other alterations described in the section on customizing can also be added if they appeal to you.

How far you want to go is up to you. If you want to approach the ball-bearing slickness of those long ago DA revolvers, though, you'll have to do at least some of the work outlined here.

The procedures just outlined are specifically for the basic Smith & Wesson design used in all its solid-frame DA revolvers since around 1900, with only minor variations. Though this design differs greatly from the contemporary Colts, and from the later and more modern Colt, Ruger, Wesson, Charter, etc. designs, the methods and principles apply to all. To simplify matters a bit, let's review some of the differences in other guns and how they are attended to.



Basic Colt DA design (pre-MK-III) differs a great deal from S&W, but all operations remain the same.



On older Colt DA revolvers, side plate may become bulged outward, allowing hand to move away from ratchet and spoiling timing. Flatten side plate with soft hammer.

Pre-1969 Colts use a different hammer rebound system, employing a lever which is acted upon by a leg of the mainspring. By smoothing all contact areas (lever, trigger, spring, frame) the energy required to overcome the rebound system is reduced, and the DA pull is lightened.

Later Colts (MK III series), Wesson, and Ruger designs do away with the rebound system and use a transfer bar between hammer and firing pin instead. Again, polishing to insure maximum ease of movement of the transfer bar will reduce the DA pull.

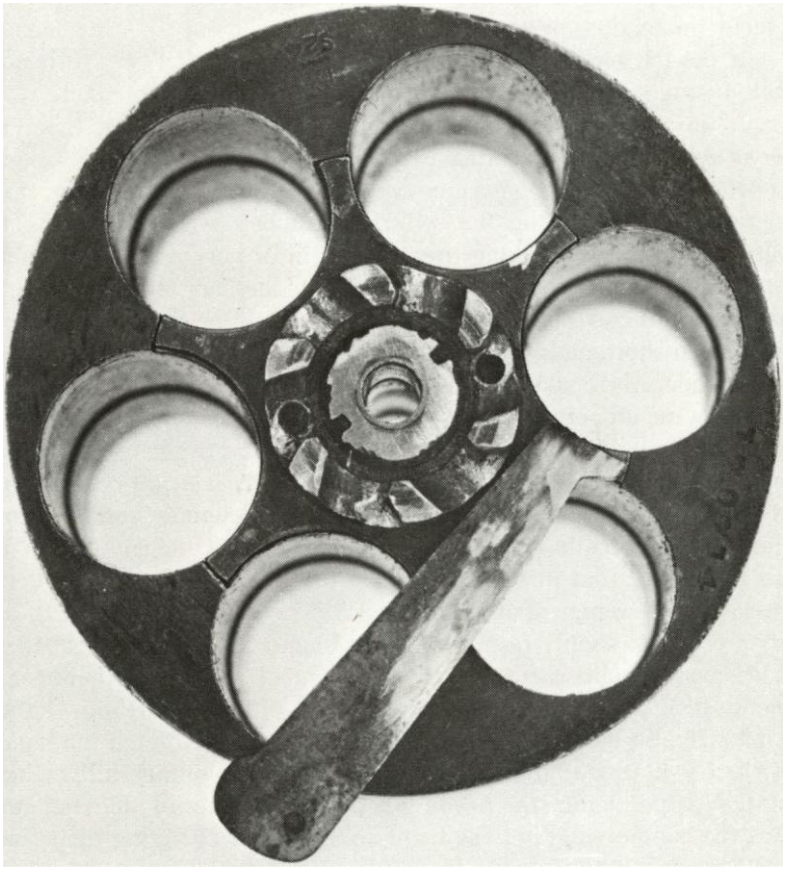
And so it goes. Examine the function of every part in comparison to the S&W example given and you'll have no difficulty figuring out the changes necessary in the processes. It's still just a matter of smoothing and polishing, and of insuring proper, close tolerance fit of all the moving parts.

CORRECTING TIMING

Timing—regulating the functions of bolt, hand, trigger, hammer, and cylinder in relation to one another—is worthy of more or less separate treatment. All the tuning and smoothing in the world isn't going to help much if the gun is basically out of time.

The very best results will be obtained from a tuning job if the gun's timing is checked first, then corrected if necessary. While we might think of timing as being needed only in a worn gun or when parts are being replaced, it is a sad fact of life that many brand-new guns are delivered by some factories very badly out of time. I've already mentioned one such instance, and that gun cost its police- officer owner $200—and I could list many more. The fact remains that many new guns do need additional timing work before they can be relied upon for serious use.

Proper timing requires that: 1) initial trigger movement withdraw the bolt clear of its notch in the cylinder; 2) the hand then engage the ratchet and rotate the cylinder; 3) that the cylinder be rotated the correct amount; 4) that the bolt then be released to pop up into its cylinder notch; 5) that all this end with the hammer at full cock or at DA dropoff without jamming or parts interference.



S&W ratchet and hand; hand nose must be thick enough to produce full cylinder rotation; note bright spots where this hand has worn thin from rubbing on the frame.

Critical areas are hand length and nose shape, bolt height, trigger/bolt engagement, and trigger/hammer relationship.

The first step in S&W DA guns is to observe whether initial trigger movement (whether directly or by rotating hammer rearward) draws bolt down and clear of cylinder before hand starts to rotate cylinder. If not, bend the forward trigger extension which bears downward on the bolt very slightly with a hammer and soft drift. Repeat if necessary, but take care not to break or crack the extension. Alternatively, the shelf of the bolt on which the trigger extension bears may be bent upward. In extreme cases, it may be necessary to bend both parts to achieve the amount of correction needed.

If the trigger is inadvertently bent too much, don't try to bend it back. Just file off the excess. Reverse bending is likely to break it.

In any event, regulate bolt travel so it just barely clears the cylinder as cylinder rotation starts.

Now, continue trigger movement until cylinder rotation stops, keeping light friction on the cylinder. Just before rotation stops, the bolt should pop up, striking the cylinder in or very near the funneled channel leading into the bolt notch. If it does not, then the trigger extension and corresponding bolt surface should be deburred and polished, then shortened very slightly until the bolt pops up freely at the proper time. Also make certain the bolt spring is not too weak, kinked, or otherwise inoperative. On older S&W's, some adjustment can be made on the bolt spring screw at the front of the trigger guard. While maintaining light pressure in the cylinder so its inertia doesn't give a false reading, continue trigger movement until cylinder rotation stops. Check very carefully to see if the cylinder rotates far enough for the bolt to enter its cut in the cylinder. If not, the hand is too short, and must either be replaced or lengthened.

I prefer to simply peen the original hand to greater length. Lay it on a smooth, solid surface and with a small machinist's hammer or smooth-face punch, peen the center third of the hand body lightly. Don't strike so hard as to dent or bend it. This will stretch the hand a bit, so try it in the gun. Repeat if necessary to obtain full cylinder rotation. If perchance the peening is overdone, carefully file and stone back the contact edges of the hand nose without changing their shape until proper length is obtained.

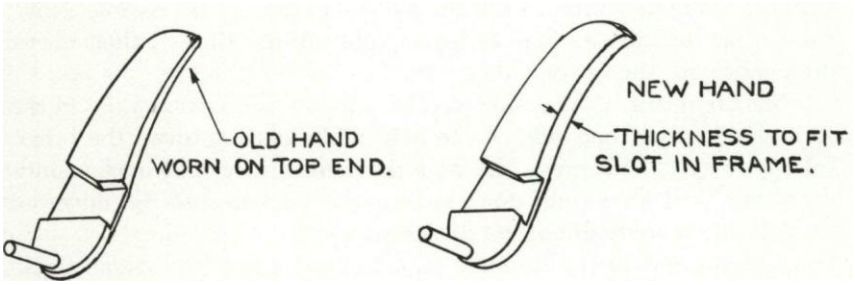
Occasionally, the hand will be worn a bit thin or its hole in the recoil shield will be worn too wide. This will cause insufficient cylinder rotation, even if the hand is of proper length, by allowing the hand too much lateral play.

The simplest solution is to solder steel shim stock to the outside surface of the hand, then refit by stoning and filing so that it slides smoothly through the hole without side play.

After all this, one must check to insure that the hammer will be caught at full-cock at least by the time the cylinder completes full rotation. With drag on cylinder, slowly cock hammer. Exactly when cylinder stops and bolt snaps in place, release hammer. It should move very slightly forward and be caught and held by the trigger nose. If not, the hand's upper engaging surfaces must be very carefully stoned back—without changing shapes or angles—until full-cock is reached just barely before cylinder lockup.

When assembling surplus part or parts of unknown origin or condition, you might encounter a situation where the rear of the hammer strikes the frame and is halted before full cock is achieved, before full cylinder rotation and lockup is obtained. To correct, carefully stone or grind the hammer where it contacts the frame until the hammer has barely perceptible backward travel after lockup and cocking. Do not remove metal from frame, and do not cut back so far that the hammer rotates past full cock. Hammer-frame meeting is relied upon to prevent the full-cock notch from riding past the trigger nose. If this does occur, the hammer will usually jam there and prevent firing.

If that occurs, then solder shim stock to rear of the hammer and stone down until hammer is halted at the proper point. While a modest amount of cylinder/barrel misalignment is both common and acceptable in a service revolver, alignment should be achieved as closely as possible during timing.



Hand (Colt shown) may wear thin, as at top, and should be built up to restore proper cylinder rotation.

CORRECTING ALIGNMENT

Alignment is checked by means of a polished "range rod" which is a slip fit down the barrel. You can make one easily from drill rod, polished to just barely pass freely through the bore, to extend about 1/2″ into the cylinder. With the gun cocked, cylinder locked, slip the range rod down the bore. If it enters the chamber mouth freely, alignment is within factory specifications, though theoretically this allows it to be out of alignment by an amount equal to the depth of the rifling grooves. This, however, amounts to only ·0025- ·0040-inch maximum and will not generally produce any visible reduction in accuracy.

More precise alignment can be had by using a two part range rod as shown. The female end is of cylinder length, shaped and dimensioned to be a slip fit in the chamber and chamber throat. The reduced end of the male part is a slip fit in the female. In use, chamber the female end and rotate into position behind the barrel, then insert male section down the bore. When the two mate easily, barrel/cylinder alignment is perfect, bore and chamber concentric. When this method is used, you'll often find that minor tolerance between chamber locations will prevent all chambers from aligning perfectly. Usually there will be one or two that won't quite make it. The tiny amount they are off won't affect accuracy visibly.

Achieving this degree of barrel/cylinder alignment while timing isn't difficult, but it can be frustrating and time-consuming. Before timing, check for lateral play of bolt in its hole in the frame. It will probably be a bit loose, and you'll see some peening on one side (RH in S&W, LH in Colt) where the fast rotating cylinder has slammed the bolt against the side of its recess. This area should be peened back and the hole then carefully fitted to minimum bolt clearance. Then, check bolt in all locking cuts in cylinder.

If it exhibits much side clearance, obtain a new oversize bolt and carefully stone its width until it fits all cuts as closely as possible. Now, install that bolt in the gun and complete normal timing, then check alignment with the range rod.

Misalignment is then corrected by moving the bolt laterally in the frame by peening one side of the hole while cutting away the other. Take care you don't move the bolt the wrong way and worsen misalignment, and above all, don't reduce the thickness of the edges of the hole any more than absolutely necessary.

Bolt support in the frame is poor in most guns. The frame thickness at that point just isn't great enough to stand heavy service. I've found one way to improve this situation.

After timing and alignment, cut a small square of thin air-hardening tool steel, then drill and file in its center a hole that will just barely clear the bolt. Dress this reinforced plate down until it will barely allow the cylinder to rotate freely when it is placed over the bolt, then silver-solder it in place, carefully aligned over the bolt hole in the bottom of the cylinder cutout. Bevel the edges for a neat appearance, polish and blue, and clean up until the bolt functions smoothly and correctly.

Depending upon the model and its particular tolerances and clearances, it is sometimes possible to nearly double the effective support of the bolt (and thus barrel/cylinder alignment) in the foregoing manner. It is of special value in guns used for double-action combat shooting where high speed cylinder rotation places abnormally heavy loads in the bolt and its supporting surfaces.

CHAPTER 11 - Rimfire Handgun Problems

Revolvers and autos chambered for the ubiquitous ·22 rimfire cartridge are probably more numerous than all other calibers combined. Guns so chambered can be made light and compact, ideal for plinking and fun shooting, and the ammunition is dirt cheap compared to even the smallest center-fires. In addition, light recoil and low report make rimfire sixguns and autos especially appealing. Except for the more sophisticated target guns, rimfire models also generally cost less. All in all, a set of circumstances responsible for rimfire guns being the most popular.

Since the low cost rimfire case is constructed quite differently from center-fires, it produces different problems in both autos and revolvers. Since it has a pronounced rim, it also poses other peculiar problems for autoloaders which are generally otherwise made only for rimless cases.

FIRING PIN AND CHAMBER PROBLEMS

When chambered, the rimfire case rim seats solidly on a very narrow ring surrounding the chamber mouth. This surface establishes headspace, but, more important, it is essential to provide support at the point where the rim is crushed by the firing pin to detonate the primer. Consistent ignition cannot be obtained without that support. Therefore, in cheaply constructed revolvers, this repeated firing-pin impact may sometimes indent the chamber mouth, causing metal to flow into the chamber and interfere with both chambering and extraction. Where the chamber is cut in relatively soft metal (cheap guns) this happens often, but in the better guns seldom or not at all. The probability is heightened by excessive firing pin protrusion, which is more common in low cost guns.

When any rimfire gun is dry-fired (chamber empty), the chamber mouth will be similarly damaged very quickly if the firing pin strikes it. In short, if firing pin protrusion is greater than the gun's headspace, it will strike and damage the chamber mouth. Older guns are prone to have such excessive pin protrusion, as are the cheaper guns of today.

When this sort of damage turns a burr into the chamber mouth— sufficient to interfere with chambering or extraction—it must be removed. The quickest and simplest method is to dress the protrusion down carefully with needle files, then polish with a small, round Arkansas stone. Avoid enlarging the chamber, or case ruptures may occur.

The wear from very extensive shooting may produce a similar problem in autos. The repeated slamming of case rims against the barrel breech may wear a depressed ring around the chamber mouth, causing excessive headspace. If the barrel is soft, as in some old model guns, it may progress far enough to cause ruptured cases. Repair is practical at that point only by rebarreling, setting back the barrel and rechambering, or by fitting a bushing and rechambering it.

If, at the same time, case rim impact causes metal to flow inward and constrict the chamber mouth, a different method becomes more practical. Make up a tapered mandrel from drill rod and drive it into the chamber. It forces the metal back into the barrel breech, partially eliminating the depressed ring, and restoring the chamber mouth to proper form and dimensions. The mandrel should be ·220-inch in diameter, with just enough taper to enter the constricted chamber mouth, polished very smooth, and hardened. Older or heavily worn guns might have oversize chambers which would require a slightly larger mandrel. Tap the mandrel out with a length of drill rod inserted from the muzzle, then polish the inside of the chamber mouth. If such a mandrel is at hand, it may also be used to correct the firing pin chamber damage already described.

Rimfire firing pins, battered through striking the chamber mouth as from some cases of excessive dry firing, may be upset at their tips, mushroomed a bit, so to speak. This can cause the pin to stick in its hole, and may also cause blown case rims by its sharp edges. File and stone the battered tip so it clears the firing pin hole, bevel the edges slightly, then harden and draw.

FRAMES, SLIDE, BREECH BLOCK PROBLEMS

Extensive firing also sometimes produces deformation of the slide or breech block face. The effect is a peening of the face where it strikes the standing breech and/or barrel breech, if the slide face is a bit soft. Usually no harm results, and functioning remains normal, only the edges of the face flare out slightly to form a sharp edge. This can be filed or stoned off easily.

Also, though, under the same conditions, the cartridge case head may form a depression in the slide face. This usually doesn't grow deep enough to cause any real problem and is best left alone. It may, however, close in the firing pin hole slightly and cause the pin to stick. With your smallest needle files, remove the burrs around the mouth of the hole and all will be well. Should the depression become deep enough to cause alarm, it can be cleaned up with a small end mill, then filled with steel shim stock cut to fit, and soldered carefully in place. Of course, the firing pin and extractor recess (if any) will then need to be recut in the plug.

Again, on the older and cheaper autos, the abutments on the frame and slide which halt rearward slide movement, may become battered or peened to the point that their burrs interfere with free slide travel. Filing off the expanded edges will cure the problem, as will replacement of the separate frame abutment in some guns.

FEEDING AND EXTRACTION PROBLEMS

Most ·22 rimfire ammunition is loaded with heavily greased bullets. This grease, as well as slivers of lead from the bullet, is shaved off the bullet during feeding and chambering. It then combines with powder residue and oil, and is acted on by heat of firing to cake up many parts of the gun. It even finds its way down into the lockwork. With some guns and some makes of ammunition, as little as 50-100 shots will foul the mechanism badly—and with age, it hardens to the point that the gun won't function properly. It is particularly prone to build up under extractors and firing pins to prevent them from functioning.

The only cure for such a badly fouled gun is complete disassembly and thorough cleaning to remove the residue. Scrapers, brushes, solvent and even files and drill bits may be required if the fouling is very old and hard. Often it seems as hard as the metal to which it adheres.

Due to the small amount of energy available for operation, rimfire autos, especially those chambered ·22 Short or used with "standard velocity" cartridges, are particularly susceptible to malfunctions caused by excessive friction, burred parts, damaged springs, etc. When there is not some other obvious reason for malfunctions, inspect and repair such of these deficiencies as exist.

Rimmed, straight-case cartridges are the most difficult of all to feed in autoloading pistols. It's logical, then, that failures to feed will comprise a large portion of the rimfire problems encountered. The major problem is weakness developing in the spring-tempered feed lips of some magazine designs, causing them to open up too much and release the cartridge too early or at an incorrect angle. This can usually be corrected temporarily by bending the magazine's lips inward, but the only permanent fix is a new magazine.

Followers may become badly worn, especially those die cast of soft metal, causing the cartridge to leave the magazine at the wrong angle. A new follower is the answer.

Any of the other magazine problems listed in the chapter on that subject can also occur and cause feeding problems.

PROBLEMS FROM EXCESS FOULING

Inevitably, there is the age-old question of ·22 Shorts ruining the gun when fired in ·22 LR chambers. In theory, extensive use of Shorts in the longer LR chamber will erode the forward portion of the chamber. However, tens of thousands of rounds would be required to roughen the chamber enough to interfere with proper chambering of LR ammunition.

Black powder and old "Lesmoke" or early smokeless shorts will, and did erode LR chambers quickly so that extraction became difficult when using Long Rifle ammunition. If you encounter a revolver in this condition, a new cylinder is the proper repair action. If that isn't available, burnish the roughened area with a tight wad of steel wool on a spinning rod. This will sometimes reduce the problem a bit, but won't cure it completely. In an auto, the one chamber can be economically sleeved and rechambered, but doing this to the six holes in a revolver is usually not practical, because it costs more than a new cylinder.

The Colt Ace auto and ·22/45 Conversion Unit contain a unique "floating chamber" that can cause problems. When fired, powder gas expands between the chamber bushing and barrel, forcing the former rearward to activate the slide. Eventually, powder fouling accumulates between the two and the chamber seizes in the barrel or is prevented from returning to battery, and the gun won't function.

With heavily greased ammunition, this may occur after as little as 50 to 100 shots or, the gun may work fine for 500 or more shots with dry bullets. Eventually, though, the floating chamber will hang up.

If the floating chamber can be removed easily, just scrape the fouling off its front and out of the counterbore in the barrel in which it rides. Make certain the chamber then seats fully and moves freely. Lubricate and reassemble.

If the chamber is seized in the barrel, put it to soak in solvent or apply anti-seize compound freely. Use a small strap wrench, or make up a brass or aluminum clamp to twist and pull the chamber free of the barrel. Don't just jump on the chamber with a pair of pliers, vise-grips, or vise and chew up its outer surface. Any burrs raised there will prevent the slide from operating correctly when the gun is assembled. In any event, all this trouble can be avoided by cleaning the Ace or Conversion Unit chamber and barrel after every 100 rounds, even oftener if heavily greased ammunition is being used.

Many rimfire target pistols are fitted with muzzle brakes and/or compensators on the muzzle. These devices load up rapidly with very hard fouling, containing a majority of lead apparently melted off the base of the bullet. The more fouling, the less effective the device, and eventually fouling will build up to the point that it is struck by the bullet emerging from the muzzle. Accuracy quickly goes to pieces then.

This hard fouling must be scraped or dug out, or sometimes may even be melted out with a propane torch. Best is a scraper made to fit the bore of the brake, ground from 1/16-inch tool steel. Both front and sides should have sharp edges. It is inserted into the brake or compensator from the rear, then rotated until it has cut out all the lead/fouling deposits. Frequent cleaning of this type is needed to keep the muzzle device functioning correctly.

Aside from these special areas, rimfire handguns are subject to all the usual problems which can plague the center-fire guns. For all them, look through the rest of this volume.

CHAPTER 12 - Refinishing

Many a pistolero walks into a gunshop and spies a sound and serviceable sixgun or auto with the bulk of its finish destroyed by wear, abrasion, or the elements, and suddenly receives an inspiration to buy it cheap, refinish it himself, and have a like-new gun at a bargain price. Sure, that's possible, and even fairly easy, but for every gun home-refinished to increase its value, I've seen twenty or more on which either the finishing or the preparatory polishing was hopelessly botched. Invariably, that decreases rather than increases the value of the piece.

Actually, anyone with normal manual dexterity, at least one functional eye, and the patience to work slowly and carefully, can satisfactorily refinish a handgun. The job is by no means difficult in the technical sense, but it does require hours of hard manual work and precise attention to detail. Not difficult, just tedious.

To me, refinishing a gun means slow and careful polishing so that all edges and corners remain as sharp as the day the gun left the factory, screw heads crisp and neatly radiused and flush with the surrounding surface, screw holes flat and true without any of the characteristic dishing found so often, a velvety (but not glassy) smooth surface, all topped off by a deep and uniform color if blued or by a gleaming, unblemished surface if plated. In my book, nothing less is acceptable.

By any one of several methods and any one of several compounds readily available, the bluing itself is easily accomplished by anyone who isn't a total fumble-fingers if he will simply follow the instructions accompanying the compound.

Polishing is the big stumbling block. Most often, the would be pistolsmith attempts to use the wrong polishing materials or the wrong grit and improper tools. This results either in partially botching the job early in the game and giving up, or seeing work progress so slowly that all hopes of ever finishing the job is lost. Both of these pitfalls can be avoided easily enough.

CLEANING, SMOOTHING AND POLISHING

Let's assume that you have a somewhat dog eared old Colt M1911 Government Model whose original parkerized finish is marred by numerous dings, scratches, and abraded spots, and which has collected the usual amount of fine rust somewhere along the way. The gun is complete and functional, but since it looks like a real dog, you want to get rid of that rough military finish which doesn't even conceal the tool marks. So you want to pretty it up a bit. No gun is easier to clean up and polish correctly than the slab-sided old Government Model.

Begin by completely disassembling it, including drifting the rear sight out of its dovetail, turning out the grip screw bushings from the frame, removing the ejector, and also the safety spring and plunger housing above the left grip. The object of this disassembly is to clear all of the flat and single-curved surfaces completely so that they may be polished in their entirety without the necessity for working around protrusions.

Soak all the parts overnight, or longer if necessary, in a good solvent, and then scrub vigorously inside and out with a stiff bristle brush (old toothbrushes are fine for the interior) until every vestige of dirt and grime are removed. If you find hardened deposits that resist this treatment, use small scrapers filed out of brass or copper, or shaped wood sticks, to gouge and scrape them away. Do this to all parts, then set aside the small parts and consider the frame and slide, they're the big ones.

If there are rust deposits that the cleaning did not remove entirely, trot down to the nearest large hardware store and obtain a tube of the rust remover known as Naval jelly. Apply it in accordance with the instructions, and you'll soon find that the rust has been removed. If you're working on a blued gun, you'll also find that the jelly completely removes all traces of the old blue, and a thorough application is one method of stripping off an existing blued finish if you wish to do so before the polishing work.

Once you have clean, dry, rust free metal, the preliminary work can begin. Examine all edges and comers, both internal and external, for dents and burrs. Invariably you'll find a few, and some of the older military guns wear scores of such service marks. Where a dent near an edge has pushed out a burr, first gently tap the protruding metal back flush with the surrounding area using a light, smooth-face hammer or, if in a difficult to reach spot, with a punch and hammer applied lightly. Often this will remove the protrusion, improving the appearance. But if you simply try to file the protrusion off, you'll preserve the dent in all its glory.

Where light burrs have been turned up by nicks and dents, dress them off flush with a fine-cut, flat file. If left protruding, they'll make polishing more difficult and may lead to polishing the surface out of true. If there are any very deep rust pits, resign yourself now to the fact that polishing will not remove them except at the expense of reducing parts dimensions, sometimes beyond safe or functional limits.

Assuming for the moment that you've gotten rid of the burrs and that there are no significant pits, clamp the frame butt-up in a padded vise. Tear off half-inch wide strips of aluminum-oxide abrasive cloth (not paper) in 120 grit, and go once lightly over the curved front strap, trigger guard, and forward extension of the frame in boot-black fashion to get the feel of it. Vary the tension and pressure of the abrasive until you find the degree that gives full coverage on the narrow curved surfaces without knocking off the sharp edges. Continue with this grit only until you have brightened the entire surface and have removed those various surface irregularities. Wipe clean and repeat with #200 grit A-O cloth until the marks of the coarse grit are removed. Follow this up by repeating the process with #400 grit, again only removing the marks of the previous treatment. If 400 grit doesn't produce a smooth enough finish (remember it won't be brightly polished) to suit you, repeat again with #600 grit.

Now, shifting the frame in the vise if necessary, tear narrower strips of abrasive and repeat the process on the inside of the trigger guard, both the bow and frame. This will leave a few spots around the top and rear of the trigger guard still untouched, so shape some soft pine sticks to match these surfaces and stick small pieces of abrasive on them with rubber cement (to simplify removal and replacement) and carefully work these areas over with the same sequence of grits.

Shift the frame in the vise again, and with abrasive cloth cemented to flat and curved sticks, carefully move through the same sequence of grits and operations on the narrow surfaces at £he rear of the frame. Throughout all this, take extreme care to avoid turning or radiusing any of the sharp edges.

If at any time during this rough polishing you discover surface irregularities that protrude and keep the abrasive cloth from contacting the entire surface, very carefully file them flush with the surrounding surface with fine-cut needle files of whatever shape fits the area best. It is quite likely that during the initial, coarse cross-polishing you'll discover a number of such irregularities, some that existed when the gun came from the factory, and others caused by various impacts. When finished, remove the frame from the vise and sluice it in solvent or soapy, hot water to thoroughly remove all residual grit.

On a perfectly flat surface, such as a piece of old plate glass (not thin window glass), steel plate, or carefully sanded board, cement a sheet of 120 grit abrasive cloth. Position it so that when you lay the frame down on it, you can let the guide rib at the upper edge of the frame extend past the edge of the abrasive in order to avoid reducing it during the subsequent polishing.

Make certain the abrasive lays flat and true and is without bumps and humps. Lay the frame down on one side, taking care to keep the guide rib off the abrasive, and while exerting uniform pressure at all points on it, move it back and forth a few times to lightly abrade the surface. Pick it up and take a look to make certain you aren't exerting more pressure in one area than another, thus causing that part to be ground away more than the rest. The object of the game is to produce a perfectly flat side, parallel with the opposite side. Continue with this grit until you've cleaned up the entire surface as before, and make the last three or four strokes in one direction only, passing the frame over the abrasive and off the end, avoiding any reversal which makes extra scratches.

Repeat for the other side, then peel off that sheet of grit and replace it with #200. Repeat the process, and then pass on through #400, and, if desired, #600 as for the edges of the frame. The final work with 400 or 600 grit cloth should be done all in one direction strokes without any reversals to mar the surface. Extra care should be taken to remove all grit from the previous operation before moving on to a finer grade.

When you've finished this, you'll have a perfectly bright and clean frame on sides and edges with a somewhat grainy, frosty appearance. For the time being, wipe it down with an oily rag and set it aside.

Using exactly the same abrasive grits and procedures, next clean up and rough polish first the top and rear face of the slide, then its sides. Unless you've removed the front sight for some reason or another, it will be necessary to use shaped sticks and glued-on abrasive to work around it. A slightly concaved stick will be a big help on the rear face of the slide, though it can be done with a flat one.

You can now progress to all of the small parts which will be exposed when the gun is fully assembled. Keep in mind that many of these parts depend upon full dimensions for their proper functioning and alignment, so polish them only with 400 and 600 grit abrasives, being careful not to reduce their dimensions any more than absolutely necessary. If, for example, you have a hammer or grip safety that is deeply pitted on the surfaces which locate it in the frame, either replace that part with one not pitted, or content yourself with simply polishing the surface and leaving the pits exposed. Use abrasive sparingly on these small parts for they are seldom in as bad surface condition as the slide and frame.

The key to a clean, sharp-edged hand polishing job is in carefully maintaining the smooth original curves of the top of the slide and edges of the frame, completing all polishing on those surfaces before truing up the flats on the cemented-down abrasive on a perfectly flat surface. Some turning or radiusing of the edges is bound to occur when cross-polished as described, but the amount of metal removed later from the sides produces a clean, sharp edge all around. The foregoing methods are generally applicable only when there is only finish wear and minor or very shallow, fine rust pitting. A heavily pitted or badly battered gun still requires the same polishing treatment, but must first be treated to either remove or fill the various pits and depressions if an acceptably smooth finish is to be produced.

Now is the time for some file and scraper work. Examine all the checked and serrated areas (safety, slide stop, spring plunger, mainspring housing, etc.) and select from your valuable assortment of fine- cut needle files the shapes and sizes that will fit the existing grooves. Then very carefully clean up or recut the serrations and checkering until all bright, new metal is visible. This job is not at all difficult, but it does require a steady hand and eye, good light, and full attention to the job at hand.

While a small goof won't be particularly evident in one of the small areas, the grasping grooves on the sides of the slide will be, and if you mess them up, everyone who sees the gun will know it. Go slow and easy here, and pay particular attention that you cut all the grooves to the same depth throughout, and that the outer edges are finished up clean, sharp, and parallel. See the chapter on filing.

With all the exposed metal now rough polished bright and clean, you've reached the point where you must decide what type of surface you want in the finished job. If it is to be a brightly polished, mirrorlike surface such as is found on the more costly commercial guns, then you must simply go through the entire polishing process again with successively finer grits, carefully cleaning off all grit at each change, and finishing with worn emery cloth liberally bathed in light oil.

Obtaining this glass smooth finish will require hours and hours of constant polishing. For this reason, and the fact that a bright finish is more easily marred and displays mars more readily, I prefer a "grainier" finish.

ETCHING FOR A GRAIN FINISH

This is obtained by carefully cleaning up all surfaces with 600 grit cloth, then wire brushing all surfaces rather heavily with a fine, soft-wire brush on your bench grinder or portable drill, and finishing it up with a very light etch in a three to five percent solution of sulphuric acid.

The wire brushing is simple enough, though you must practice some in order to learn the proper amount of pressure that will allow the wire wheel to "bite" just a wee bit into the surface. This can be felt readily enough when it occurs, and must be continued uniformly over the entire surface. It is easy enough to use too much pressure in some spots and not enough in others, producing an uneven appearance. Don't forget that even a soft wire brush can remove a significant amount of metal if applied too hard or too long in one place. Better several relatively light passes that produce a uniform surface than a single hard one which messes it up.

For the acid etch, try to buy the acid already mixed, but if this isn't possible wear a rubber apron, rubber gloves, and safety goggles when mixing it. Always mix in a glass, ceramic, or porcelain-coated bowl or pan, and add the acid slowly in the proper quantity to the premeasured amount of water. It will get quite hot initially, so stay away from it until it has cooled to a reasonable working temperature.

Make iron or steel wire hooks to hold each part, running the wire through the various holes in the parts, and making certain it does not contact any surfaces that will be exposed when the gun is assembled.

Submerge the parts in the acid solution, leave them two or three minutes, then lift out and examine under good light. Watch for the beginning of a lightly frosted surface and when the first signs of frosting are noted, submerge for only a few minutes more, or until the frosting is uniform all over the parts, but yet has not begun eroding the sharp edges. At this point, remove the parts from the acid and rinse thoroughly under running water. Take care here, for the impact of fresh water may splatter acid around and about. When you think all the acid is rinsed off, drop the parts in a bucket of lukewarm water into which you've placed a half-cup or more of baking soda. No matter how vigorously you've rinsed the parts, there may still be minute quantities of acid trapped in holes and crevices, and the soda water will neutralize it. Complete the acid etch on all parts, and rinse and neutralize in soda water.

At this point, don't, whatever you do, don't simply leave the acid sitting about. Transfer it immediately into a strong glass or ceramic container that can be properly capped or sealed. Between jobs I always store the acid solution in a heavy glass container placed inside a double thickness cardboard carton and padded on all sides by wadded up newspaper. This insulates the container from shocks that might fracture the glass.

Rinse the parts thoroughly in the soda water solution, then rinse in the hottest, clear water available, shake off excess, and leave the hot metal to air dry. Wipe down quickly with water displacing oil to prevent rust from forming on your beautifully prepared surfaces, as it surely will in a matter of only minutes if left unprotected.

SANDBLAST FINISH

It may be that you prefer instead the recently popular rough matte finish produced by sand blasting. If this is the case, complete your polishing through 600 grit abrasive, and then take the parts to a commercial sandblasting operation (usually found under that heading or under abrasives in the yellow pages) and have them do the job after being shown samples and selecting the degree of surface roughness you want. Before the blasting operation, protect the slide guide ribs with cloth backed tape, and also apply the same type of tape to any areas where the roughness might interfere with functioning. Once the blasting is finished, wipe the parts down with oil until the time comes to apply the final finish.

PROBLEMS WITH BADLY PITTED SURFACES

Though really deep pits are seldom encountered, a real dog may have rust pitting as deep as 1/32 inch. If a large percentage of the surface is this bad, there really isn't much hope of salvaging the gun; it is probably better, if sufficient structural strength remains for safety, simply to wire brush it heavily and use it as is. However, if the deep pits are isolated and cover only a small non-functional area, they may be cleaned out by heavy wire brushing or with a hand grinder and small stones until fresh, bright metal is exposed. Then, the parts may be taken to a first-class welder for filling the depressions by the heli-arc process. Carefully done, this will completely fill the holes without damaging the surrounding area, and the surplus weld may then be filed flush with the surrounding surfaces.

I was once able to repair a Browning HP in this fashion whose slide had a 1/4-inch hole rusted completely through it. Apparently the gun had lain in contact with some highly corrosive material for years, and the thin wall of the slide had been eaten completely away. After the hole was cleaned up, it was filled by heli-arcing and then dressed down smooth on the inside with a hand grinder and filed flush on the outside. After refinishing the repair could hardly be noticed, even though the weld material produced a very slightly different shade of blue. Also, I once saw a ·45 auto slide in which a badly rusted or otherwise damaged area between the muzzle and locking lugs had been repaired by very carefully filing a large dovetail, inserting a closely-fitted piece of steel, then silver-soldering it in place and then dressing it down to match the slide contours. As the slide was then blued, the patch was visible by the very thin line of solder which the blue did not affect. Had that slide been plated, the repair would have been completely invisible.

After any holes or deep pits are welded up and dressed smooth, polishing can progress as already discussed.

More often a slide or frame will simply be heavily pitted over the majority of its surface. In a case like this, it is impractical to attempt to fill pits by welding. If the gun is valuable enough or scarce enough or important enough to the owner to justify the time, effort and cost, the worst of the pitted areas may be chemically cleaned and then filled by selective electroplating, using the brush method. In this process, a small area is built up by applying successive layers of copper or nickel. The plating applied has no great strength, and will not restore the original strength of the part.

When rough areas are filled in this manner, the entire part of gun must then be plated for a final finish, inasmuch as bluing will not take over non-ferrous metal. As before, once pits are filled by plating, the surface is dressed smooth, and polishing may progress as before.

While I have never tried this particular process, discussions with metalizing shops indicate that the metalizing process used for building up worn machine parts could also be used to fill pits or damaged areas on any gun part. Generally, the metalizing process consists of melting and atomizing steel or other wire by means of an electric arc, and then "blowing" a spray of atomized molten metal to adhere to the surface to be built up. There is no reason a good metalizing shop could not fill pits or depressions in this fashion, after which the area could be dressed smooth and polished as before.

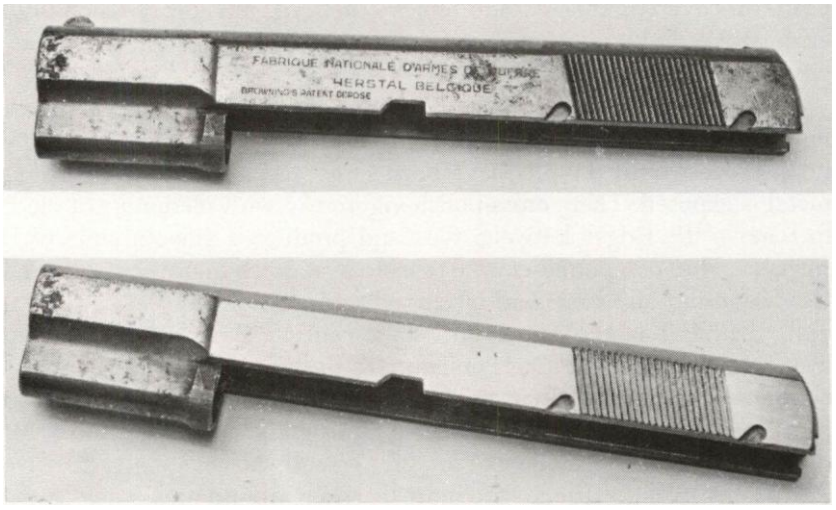
Probably, though, the most you'll have to contend with is typical light surface pitting. While the surface may be polished down to remove such pits in the fashion already described, it may require a great deal of time and effort to do so. Proper use of files to prepare the surface for polishing can greatly simplify the job. Again, all protruding parts should be removed as before to leave the surface completely clear for filing. On long single-curved surfaces such as the rounded top of a slide, use a large 12-inch single-cut, fine-cut file laid flat lengthways upon the surface and pushed forward to produce a long narrow flat the length of the surface. Move the file slightly to the side, and repeat, overlapping the initial cut by about half its width, and continue this process, a single stroke for each flat, until the entire surface has been covered. Take care to remove the same amount of metal with each stroke, and do not attempt to cut away the pits completely at one pass.

Cover the complete area with light single strokes overlapped, then lightly cross-polish with medium grit abrasive cloth and repeat the filing process until the pits have been removed and only clean, bright metal is exposed. Then, cross-polish vigorously with medium grit cloth to remove the ridges between flats and produce a smoothly-radiused surface. The compound-curved surfaces require more complicated treatment and an assortment of curved and narrow flat files. The general treatment is the same, but more caution is required to avoid changing the basic contours or gouging the surface. Try to maintain continuous overlapping narrow flats the full length of the surface, and if the surface is narrow, use abrasive cloth glued to shaped sticks for removing the ridges and flats to produce smooth curves.

In any event, extreme care must be taken around areas such as the rear of the ·45 auto slide where various cuts and recesses interrupt the curved edges. If one gets the least bit careless, files and abrasive cloth will ride down in these interruptions and produce a dished or scalloped effect that is not at all desirable.

Once all curved surfaces have been given this treatment, it is time to clamp the parts solidly in a vise and carefully file the flat areas true to a depth that removes the pits. Do not file working surfaces such as the slide guide ribs, even if they are rough and pitted. They will be covered up when the gun is assembled, and their full dimensions must be retained, even if they do look sorry when exposed.

Using a ·45 auto slide as an example, clamp it in the vise with one side as nearly level as possible. Lay a large flat file large enough to cover the surface flat against the slide and push it forward with just enough pressure that it cuts slightly. Adjust the pressure and the manner in which you hold it so that it cuts evenly over the entire surface. Cover the surface in single long strokes, brushing chips out of the file teeth after each stroke. If chips are allowed to build up, they will score and gouge the surface, making removal of extra metal necessary later to produce a smooth surface. Continue this until pits and dents are removed and the edges are true and sharp.



This Browning HP slide was badly rusted and pitted, nearly ready for the junk heap. Below is the same slide after draw filing. A few more strokes will remove the few pits remaining, leaving a fresh clean surface for refinishing.

The frame is then given exactly the same treatment, though it isn't possible to cover the entire area with one file. Consequently, the file should be moved in a forward and diagonal manner so that the entire surface can be covered with a single stroke. Take extreme care to insure that as the file moves off of large areas into the edges of the magazine well that pressure is relaxed slightly to prevent a deeper cut taking place on the reduced areas. Ideally you want to remove the same amount of metal over the entire surface and keep the two sides perfectly flat and parallel.

Filing the surface in this manner, of course, will most likely remove or dim the original markings, with the possible exception of the serial number which is generally stamped more deeply than others. If it appears that the amount of stock removal necessary to clean up the surface will make the serial number illegible, prepare in advance by recording the number and obtaining a set of number and/or letter die stamps which must then be used to restore the number exactly in its original location. Ideally the stamp should be of the same size and type face as the original markings so that the original number can be deepened as it begins to fade away. However, if this is not possible, any legible sized stamp may be used.

Keep in mind when performing any refinishing or alteration work that mere possession of a gun with a mutilated, illegible, or removed original serial number is a Federal offense and is considered prima facie evidence that the possessor has willingly and knowingly violated the law by mutilating or removing the number. If for some reason a Federal BATF agent should drop in and look over your shoulder at the exact instant your last file stroke has removed the number and you haven't yet had an opportunity to replace it, your record of the number and the presence of stamps to re-apply it should keep you out of trouble, along with your statement that you know the law and that you are prepared to replace the number immediately.

Other markings removed in the process need not ordinarily be replaced. The gun may look naked without the manufacturer's name and model number visible, but as far as working guns are concerned, this will not affect its value and certainly not its utility. However, when restoration of a scarce or valuable gun is the name of the game, it is sometimes desirable to deepen the original marks as polishing progresses. Since original markings are applied by roller dies, there is no way you can duplicate them with hand stamps. The only practical method of deepening or renewing such marks is by careful hand engraving, and that is a job for a specialist. Unless you are an experienced engraver, forget it!

Polishing and preparing revolvers and some of the more modern streamlined autoloaders becomes a bit more complicated and actual skill in polishing becomes more important. The frame and barrel, for example, of a S&W K38 contains all manner of compound curves which make it especially difficult to retain the original contours and sharp edges. Where the gun is not in bad shape, I have found the most practical method to be a combination of hand polishing, as already described, and careful use of shaped, felt bobs coated with the finest abrasive powder and used in a Moto-Tool or other hand grinder. When working around sharply curved areas such as the ejector rod housing, cylinder flutes, and rear line of the frame, these hard felt bobs should first be shaped to the approximate contour of the area to be polished.

This is easily done by chucking a new felt bob in the Moto-Tool clamped solidly and then applying a small wood-turning chisel or gouge lightly to the felt, cutting it to shape. This is probably best illustrated by cutting a half-round groove in the bob to fit the radius of the outer edges of the ejector rod housing, and by cutting a bob down to the same radius as the cylinder flutes. Once this is done, the bob is charged with abrasive, and carefully applied in light successive passes to the area to be polished, thus retaining the true original contours.

One word of caution when using the hand grinder for polishing; do not, as is so tempting, attempt to hold the gun or part in one hand and then free-hand the Moto-Tool in the other hand. This may look like an easy way of getting the job done, but it leads to wavy and dished surfaces almost without exception. Always clamp the gun or part solidly in a vise, and then utilize an adjustable forearm rest or pad to steady your hand. Use the off hand to help control the tool for smooth, even strokes.

A revolver's convoluted contours also requires more extensive use of carefully shaped sticks with abrasive pads glued thereto. But in the end, there simply isn't any cheap, quick, and simple way to achieve a first-class polishing job on a revolver.

Pay particular attention—when polishing or filing on revolvers— that the very thin sections in some areas of the frame are not reduced too much in thickness. In the case of the lower wall of the cylinder recess, the cylinder bolt or stop is supported by only a very thin wall of steel, and if this should be reduced very much in thickness, it will peen out rapidly under the loads of double-action firing and cause excess looseness and misalignment of the cylinder. Likewise, care should be taken to avoid changing the dimensions of the frame lugs which restrain the cylinder from moving rearward when the gun is opened. In S&W guns this is a riveted in stud while in others it is an integral part of the frame or side plate. Where the stud is removable, it may be removed and replaced with a new one if in bad shape. Otherwise, a minimum of polishing should be done on it.

The side plate of a revolver requires special attention in polishing, as do the front and back straps or grip frame where they are separate items as on most single-action guns. Side plates should be firmly attached by their screws and polished in conjunction with the frame. Only in this fashion can proper fit and flush edges be maintained. In order to do so, a spare set of old side plate screws should be used, with their heads filed flush with the surface and their driver slots deepened to facilitate installation and removal. Once refinishing is completed, the plate may be assembled to the gun with new screws to present a virgin appearance.

Straps and grip frames should also be installed and the surfaces adjoining the frame polished simultaneously with the frame for the same reason. Here, though, the screws are deeply countersunk, and will not be damaged or polished down so the originals may be used. While the side of a revolver crane may be polished separately, the crane should be installed in the frame and clamped in the closed position for polishing the front and rear surfaces so they will mate with the frame.

Essentially, all the same principles and operations encountered in polishing an autoloader are required in polishing a revolver. It just takes more care and attention to detail and a bit more time. Of course, the polishing and final surface preparation should be carried on to the same degree already described. This involves deciding whether or not you want a glossy, matte, or sandblasted finish.

BLUING

The most popular finish, of course, is bluing. Actually the word "blue" is a misnomer, inasmuch as the final finish is more black than blue.

Many gunsmithing references of the past have contained dozens of formulas for home-brewed bluing, blacking, and browning compounds. Forget them. Most were formulated when good commercial bluing compounds were not available. Today there are several very fine compounds, all of which produce equally good results, providing one follows the instructions for their use to the letter. I have long preferred the Oxynate 7 compound sold exclusively by Brownell's, though there are several others (listed in our appendix) which do an excellent job.

Fortunately, handguns can be given professional-type bluing without the need for large tanks and burners and large quantities of solution. Almost any handgun can be accommodated in a deep sheet- steel or sheet-iron bread pan obtained cheaply from hardware and department stores. Avoid the use of plastics, non-ferrous, or coated metal containers. The degree of heat required is easily obtained with sufficient uniformity on a gas range. When mixing the compound it is absolutely essential that you follow the maker's instructions precisely to the letter, and it is equally important that you maintain the proper purity of the solution, and that its temperature be regulated exactly as specified. The latter will, of course, require the purchase of a proper thermometer which may be generally obtained from the supplier of the compound.

You'll need an assortment of supplies such as clean, grease-free cotton gloves and swabs, finishing oil, wire hangers for parts, etc. Also, inasmuch as hot bluing solutions are caustic, you'll need the same safety equipment mentioned earlier in regard to use of acid. Bluing solution splashed on bare skin will burn severely, and if splashed in your eyes, probably blind you. A certain amount of caution and self protection is necessary if you are to enjoy the fruits of your labors.

Nevertheless, assuming you have all of the gun parts completely cleaned and polished and/or sandblasted to the chosen surface texture, it's time to get on with bluing. In my opinion, Bob Brownell is the fountain-head of information on bluing, so with his kind permission we'll insert here the instructions he issues on the subject, edited down to just what applies to handguns and home or small-shop use. Let's use Bob Brownell's instructions for Oxynate 7 compound, condensed to suit just our handgun needs.

A. Clean the properly polished gun and parts in a good, commercial cleaner such as Dicro-Clean 909.
B. Rinse and scrub in cold, clean water.
C. Immerse in Oxynate 7 solution for 15 to 30 minutes.
D. Rinse and scrub in cold water.
E. Rinse in boiling water.
F. Dry and oil.

The minimum requirements for bluing a gun or two are as follows:

(Author note: It may be of interest to know that Bob Brownell blued several hundred guns with no more equipment than this minimum requirement list. He does not recommend it, but it can be done with care.) One carton of bluing salts, some bread pans for pistols, some wash tubs for rinsing, the wife's deep fat thermometer, and a lot of determination—and use the best possible cleaner—such as our 909.

YOU WILL NEED

Two tanks are the minimum you can get by with. This is for the man who wants to blue an occasional gun. Tank No. 1 will be for the Oxynate 7. Tank No. 2 will be first used for the cleaner. When the gun is cleaned, the cleaner is immediately dumped and the tank is filled with clean, cold water in which the gun is scrubbed and rinsed and then transferred to the bluing tank. After bluing, the gun is returned to the cold water tank for scrubbing and rinsing. Then the water is boiled and the gun is rinsed in boiling water, dried and oiled by hand.

Tanks should be made of mild iron or stainless steel. Seams must be welded and Caution: It takes less than ·001 of an ounce of free copper per gallon of solution to "kill" a blue bath. NEVER use brazed tanks. A common black iron or steel bread pan is satisfactory for pistol work, providing the pan is large enough. The average pistol tank should be 6 inches wide, 6 inches deep and at least 16 inches long.

HEAT SOURCE: You will need heat for the cleaner tank, bluing tank and hot water rinse tank—a minimum of two burners. The rinse and cleaning tanks can be heated by ring stove burners or hot plates by the occasional bluer.

The heat source for the bluing tank is quite critical. It must be able to bring the volume of the bath up to operating temperature rapidly and must be adjustable in order to control the bath temperature. Gas burners are best. Burners should be mounted below the tanks so that the tip of the flame cone just brushes the bottom of the tank being heated—usually about 2 inches which depend upon your gas pressure and the type of gas being used.

DETERMINING QUANTITY OF OXYNATE 7 TO BUY

MIXING OXYNATE 7: Oxynate 7 is mixed with water in a ratio of 10 pounds of Oxynate 7 to one gallon of water. To estimate your requirements, determine the volume of the bath you will be using and divide by 231 (cubic inches per gallon) to give gallon content of your bath.

When doing the above estimate, you should allow about 12 percent volume increase due to the addition of the Oxynate 7 to the water. Make sure the tank will hold it.

CLEANER: Fifty percent of the problems which beginning bluers write us about, are traceable to improper cleaning or the use of incorrect cleaners. You must remember that as with many other professions, CLEANLINESS IS NEXT TO GODLINESS! Use a good, proven commercial cleaner (such as Dicro-Clean 909) and use it exactly as directed.

THERMOMETER: A good thermometer is your most important working tool when operating a bluing bath. Glass thermometers should not be used. They break easily, releasing mercury into the bath and killing its bluing capabilities. Cheap cooking thermometers will do for one or two bluing operations but because of their construction, bluing solution can and will seep into the quill and cause incorrect, damaging readings. Use only thermometers which are constructed to withstand high caustic chemical action at a high of 350 degree F.

OXYNATE S: Heretofore certain high alloy steels were prone to come from the bluing tanks with a faint red cast—tempered springs, heat-treated spots on receivers, ejectors, etc. Manipulation of operating temperatures generally would correct this, but it was time consuming. The addition of Oxynate S to your bath prevents this from happening. Also, many cheaper guns have cast iron frames of very uncertain metal content. These invariably come out a red cast. In most instances the use of Oxynate S will prevent this from happening.

BLUING TANK CLEANER: Like the Oxynate S, a new discovery. After prolonged use, all bluing baths get a certain amount of suspended, used-up chemicals in the solution. This “Crud”, as it is called in the trade, does not slow down the bluing action but it can be a nuisance—to such an extent that the operator will dump his bath long before it is worn out. “Tank Cleaner” cleans up the solution and causes the “Crud” to float to the top of the bath where it can be readily removed, leaving a good, clean bath for operation.

MISCELLANEOUS VALUABLE ITEMS

HEAVY DUTY GAUNTLET TYPE RUBBER GLOVES: For all work around the bluing tank and rinse tanks. Get them large enough so you can remove them quickly when hands are sweaty.

RUBBER SHOP APRON: Saves clothing and skin.

PARTS BASKETS: Large and small for pins, springs, screws, frames and actions. These should be of steel, welded construction.

FACE MASKS AND GOGGLES: Simple safety precautions when dealing with any chemical.

EXHAUST FAN: This you can rig up yourself from an old squirrel-cage, furnace fan or second-hand, exhaust fan. Takes heat and steam out of bluing room.

DIPPING OIL: This can be mineral oil, light motor oil, or, best yet, a good water-displacing oil. To be used following final hot water rinse to give best protection to finished blue. DO NOT use exotic new rust removing oils (so-called) prior to the bluing operation.

SETTING UP

When you have the cleaning tank, the bluing tank and the boiling water rinse tank in operation, there is a great amount of steam and heat being released. For comfort and protection of equipment, your tanks should be mounted close to an outside wall opening. A simple exhaust fan (old furnace, squirrel-cage type is fine) will easily keep the excess humidity under control. Most shops build a partial partition between the bluing room and the shop for further protection.

Running water in the bluing room is a fine asset if available, but not a necessity. Good, bright lights are a necessity with one good light also directly over the cold water rinse tank. A shelf or two is also mighty handy!

If much bluing is to be done, a wood slat raiser on the floor will increase operator comfort and safety from slipping.

Use black iron pipe for all gas lines.

PREPARING OXYNATE 7 FOR USE

Before describing the mixing of the bath, it is quite important that you understand the principles involved. All the modern "heat bath" bluing solutions are used at what is known as "supersaturation."

An example of supersaturation: take a cup of water, put it in a pan and place on the stove without heat. Now, start adding plain table salt and stirring. You will find you can only dissolve so much salt in the water. If you turn on the heat you will discover that as the water heats up, more and more salt dissolves. As more salt dissolves in the water, the boiling point of the solution goes up way beyond 212 degrees F. The hotter you get it the more salt goes into solution and the higher it boils. This is "supersaturation." If the solution is cooled, the salt goes out of solution as temperature falls off, settling into the bottom of the pan.

Oxynate 7 is used in the same manner. In order to get enough chemical into solution with water (oxygen and hydrogen) it has to be heated to create a supersaturation of chemicals. When the condition of supersaturation is such that the boiling point of the solution is 292 degrees F, you have the proper balance of all chemicals to produce a blue black colored finish on steel. If the point of supersaturation (or boiling point) is lower than 292 degrees a grey color will develop on the gun. If the point goes much above 292 degrees of saturation, a red color develops.

As you study this section on actual bluing, you will discover that you are actually controlling the point of saturation by either the addition of water to your bluing bath to lower its operating temperature; or adding more salts to the bluing bath to raise its operating (boiling) temperature.

WATER

Water that is as chemically pure as possible should be used in the bluing bath. Rain water is excellent, if available, so long as it does not come off a copper-sheeted roof. In areas which have high mineral content in the water, the gunsmith should use treated or distilled water. Under normal conditions, however, straight tap water will give satisfactory operating results. Tap water can be used in the cleaning and rinse tanks.

MIXING THE BATH

First mount your thermometer along one side of the tank at center position. Be sure the quill (stem) is at least one inch from the bottom of the tank and one inch from the side of the tank.

In the bluing tank, place 3½ quarts of water for every 10 pounds of Oxynate 7 being used. Slowly pour the bluing salts into the water, stirring often. Care should be used in pouring in the salts because heat is generated by the dissolving Oxynate 7. Too large a quantity at one time may cause the solution to boil or erupt. Stir frequently until the salts are completely dissolved.

You should get yourself some sort of flat iron or mild steel "paddle" to be used when stirring the salts.

When the salts are dissolved, turn on the heat source. When the solution starts to boil, stir thoroughly and note the temperature. If it is below the required operating temperature of 292 degrees F., add more salts to increase the supersaturation of the solution thus increasing the solution's boiling point; or, permit the solution to boil until enough water is boiled away in the form of steam to raise the boiling point to 292 degrees.

If the boiling temperature is above 292 degrees F., water must be added to the bath.

The bath starts to color steel at about 285 degrees F., but is most efficient on common gun steel between 290 to 295 degrees F. Surface coloring will be completed in approximately 15 minutes—when the gun can be removed from solution—and maximum penetration is complete at the end of thirty minutes.

That is all there is to it. Faulty results, poor finishes, and miscellaneous gremlins are human errors and no fault of your bluing solution.

CAUTION: Oxynate "7" is Caustic. Always wear rubber gloves when working with it. It is also advisable to wear a plastic face shield when the bath is in operation to prevent damage to face or eyes, which could prove permanent, should the very hot solution come in contact with your face or skin.

Always keep a wide mouth jar of vinegar close to your bluing tank. If Oxynate 7 splashes onto your skin, immediately dip hands into vinegar, or splash vinegar over the affected area. Flush with plenty of water.

In case of a serious accident, call your doctor. Advise him to treat the same as for bad lye burns. External: Flush with acetic or boric acid and water. Internal: Sweet oil, stomach pump and neutralizers for caustic alkali.

Oxynate "7" attacks leather, wool, skin. Wear cotton clothing, rubber overshoes, and other non-animal clothing when working in your bluing room.

BLUING OPERATIONAL PROCEDURE

When getting ready to blue and firing up the bluing room, you will avoid a great many potential problems if you adhere to the following steps just as a matter of course:

The first time you start up your bluing bath after it has been originally mixed and allowed to cool and stand a while, take note of how long it takes the bath to heat up to its boiling, operational temperature.

Read all the material in this set of instructions thoroughly (!) before doing any of the following:

Step No. 1. Turn on your source of heat and allow the bath to come to operating temperature.
Step No. 2. Just before the Oxynate 7 bath comes to temperature, and only then, turn on the heat under your cleaning tank.
Step No. 3. When the bluing bath is at proper boiling temperature put the guns in the cleaning bath and clean. Repeat: do NOT start the cleaning cycle until the bluing is ready.
Step No. 4. Rinse and scrub in cold water.
Step No. 5. Blue.
Step No. 6. Rinse and scrub in cold water.
Step No. 7. Rinse thoroughly in boiling water.
Step No. 8. Dry and oil.

DIRT AND GREASE

The first step after polishing and before bluing is to be certain the piece to be blued is absolutely clean. You often hear of naptha or other gasoline products being recommended for cleaning, but experience has shown that the use of any gasoline during the process is courting trouble. There is always the possibility of a bit of the oil being left on the surface of the steel, resulting in grey streaks in the finished product. Also, many solvent type cleaners leave residual deposits on the metal surface which can, and do, act as a chemical barrier between the Oxynate 7 and the steel.

The use of lye or other very caustic cleaners should be avoided. Overexposure to this type of cleaner will result in a slight etching of the metal which will show up as bright, white specks after the gun has been blued. The best that we can recommend after years of experience and market sampling is “Dicro- Clean 909” which completely saponifies all dirt and grease. It is strong enough to do the job, and, if handled according to the following instructions, cannot possibly harm the steel.

Use five ounces (by weight) to a gallon of water. Immerse the parts to be cleaned when you have reached between 180 degrees F. and a slow rolling boil. Leave in the cleaner for approximately 10 to 15 minutes, after which the parts should be removed and placed into a tank of clean tap water and scrubbed well with a vegetable cleaning brush.

When thoroughly scrubbed, examine the parts under a strong light for signs of puddling around screw holes, barrel rings, etc. If no oil slick or puddling appears the parts can be assumed clean.

If oil is present, return the parts to the Dicro-Clean 909 for another minute or two and repeat the above examination.

Regardless of claims to the contrary: In bluing, cleanliness is perfection assured.

After cleaning in Dicro-Clean 909 the steel is chemically clean. Do not allow parts to stand in open air or in water for longer than is absolutely necessary. The oxygen in the air and the free oxygen in water will attack the steel and cause it to rust very rapidly. This rust might not be evident to the naked eye, but will show in the form of black specks or white specks after the gun has been blued, rinsed, and oiled. Go direct from cleaner to cold water rinse, then quickly to blue.

SUSPENSION OF PARTS

Why suspend? Contact with the edges of the tank will cause excessive heat conduction to the parts, thus making them red and contact points do not come in contact with the bluing solution and therefore won’t blue. Vegetable strainers made of steel or iron wire are ideal for suspending small parts. For large parts, weld yourself up some baskets from welding rod with short legs on each corner and handle. Be sure to remove plating with a mild muriatic acid solution.

For barrels, get yourself some quarter-inch drill rod or welding rod and bend them into big “U”s the size of the inside of the tank, bending hooks into the “U”s legs to suspend the bottom of the “U” an inch from the bottom of the tank. Make two of these. They are removable and should be kept out of the way when not in use. When in use, be sure not to put them so far apart that the barrels won’t rest on them.

HANDLING BARRELS AND ACTIONS

Then make yourself some “Z” shaped affairs out of small diameter, welding rod or drill rod. Use these to handle barrels and actions in the cleaner, blue tank and hot rinse.

RED RUST

Oxynate 7 cannot cause "red rust" to form on the surface of steel. However, if your solution goes above 300 degrees F. a red "smut" will form. This is a natural result of the chemical action which will not occur if you handle the operation properly.

If you are handling all phases correctly and you do get a red coloration or a reddish looking precipitate on the surface of the gun there is just one thing that can be wrong: you have a bad thermometer.

Should the temperature of your bath go much higher, the bath itself will take on a reddish cast and will no longer blue-blacken steel.

ADDING SALTS

Other than to control temperature, the only other addition of salts needed will be to keep the level of the bath at a sufficient height to conveniently cover the work. The only loss incurred in the bath's strength is from drag-out or solution carried away when parts are removed from the bath.

Do not add salts while guns or parts are in the bath. Addition should be done between jobs or when the bath is first heated. Addition after long storage may be necessary due to moisture being absorbed from the air and diluting the solution. This is particularly applicable during hot, humid weather, and if salts are not added to bring the bluing solution back into balance to boil at 292 degrees F., then this excess moisture must be boiled away.

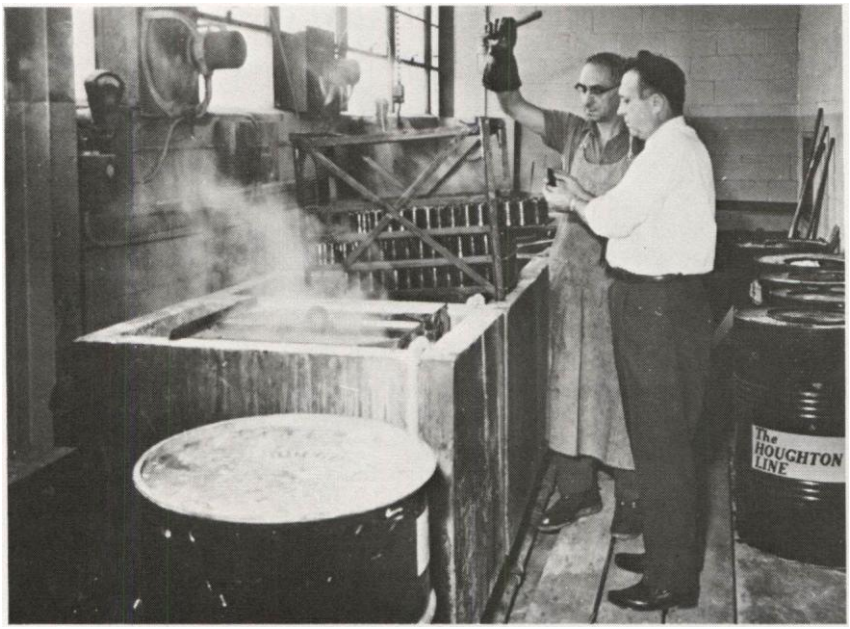
REMOVING FROM BATH

After the parts have been allowed to remain in the bath for the determined length of time, they are withdrawn and examined for color. If satisfactory, rinse in an adjacent tank of cold water. After being thoroughly scrubbed and rinsed to remove all traces of solution from recessed areas, the parts are transferred to a pan of boiling water and allowed to boil for ten minutes to insure the dissolving off of all excess traces of bluing solution.

All parts are then gently dried over an open flame and transferred to a final tank of oil. We recommend Water Displacing Dipping Oil.

WHEN TO DISPOSE OF BATH

Under normal operating conditions your bluing bath will start to show a faint red cast when it is starting to "wear out." Also, you will note that it takes longer than normal for the gun to take on the usual beautiful deep color. Addition of fresh salts to a red-cast bath is not recommended as the bath is already past saving. The life of a bath will vary greatly from shop to shop, depending on a whole lot of variables. The best answer to the question can well be: throw it away when it quits bluing!



Commercial bluing operations, such as this one operated by the Poly-Choke Company, require extensive special equipment far beyond the capabilities of the amateur craftsman.

STORING YOUR BLUING BATH

Leave it in the bluing tank! It will neither attack the tank metal, nor be affected by constant exposure to the tank. If there are going to be regular, protracted periods of several days between each time you blue, you might consider making a floating lid for your bluing tank from thin, black iron. This is simply a lid made about 3/4-to-1 inch smaller than the inside dimensions of your tank with about a 1 inch flange or lip as sides for the lid. A couple of handles are welded onto the inside of the lid and the lid is then placed into the bluing tank, UPSIDE DOWN—edge or lips of the lid UP and the handles UP. The lid floats on the solution, protecting it from the elements, and is removed prior to starting the heating cycle.

After bluing is completed, you may want to add a few finishing touches that perk up the gun's appearance and are often found on new factory guns. For example, first bluing the hammer and trigger and then polishing the side flats bright provides a pleasing contrast and a pleasant departure from a monochromatic color scheme. To do this, complete the bluing, then let the finish age for a few days. Then, cement a sheet of the finest abrasive cloth or paper you have (crocus cloth is good) to a smooth flat surface and carefully stroke the flat sides of the part on it until the blue is removed and a smooth bright surface results.

The ends of pins and screws, autoloader extractors, and other small parts may be given this treatment to dress up the gun. You might even like to use crocus cloth over the ball of your thumbs to polish the muzzle bright for another accent.

TOUCH-UP BLUING

It may be that you simply want to do the best possible job of touch-up bluing to cover up unsightly holster wear on the high points of the gun. Regardless of advertising claims to the contrary, I have yet to discover a touch-up blue solution that will match factory finish perfectly. It's obvious that it cannot, since there are differences in finishes between manufacturers and individual models of a particular manufacturer. For example, S&W uses a heat blue on some of its models, Colt uses yet another process, and Ruger even another. The results are all good, but they are not identical, and so it is impossible to expect any one solution to match them perfectly.

All of the touch-up blues offered by the well-known trade names (Brownell's, Numrich, Birchwood, Casey, etc.) are good. The secret— if there is one—in obtaining the best possible job with any of them is in proper surface preparation and application. The worn surface must be chemically clean and absolutely free from grease. Second, results are improved if the metal is warmed to about 100 to 110 degrees Fahrenheit; in other words, until it feels at least slightly warm to the touch. A little extra heat won't hurt, but it doesn't seem to add all that much to the job. Third, the solution must be applied quickly and evenly and in adequate quantities without allowing it to run and dribble all over the rest of the gun. Fourth, application must continue over a period of time, usually only a moment or two between coats, until the desired depth of finish is obtained. Lastly, everything used in applying the finish must be grease-free and clean, and you must avoid touching the prepared surface before application.

LAMPING, OR HEAT BLUING

"Lamping" is an old term for the bluing or otherwise coloring of metal by the application of heat and oil. Most people simply call it heat bluing today, and let it go at that, but the old name stems from the use of an alcohol lamp or torch to supply the heat.

Pin ends, screws, sight blades, and the like are easily blued by cleaning and polishing thoroughly then heating just to the point that they begin to change color, and plunging in light oil. If the first dip doesn't produce deep enough color, burn the oil off with your torch, reheat, and repeat. Generally, two or three applications will produce a deep, somewhat grayish, blue-black that is quite acceptable with almost any other dark finish.

Bright spots on the gun proper, such as holster wear on the sides of the muzzle, can be blued in much the same fashion. However, caution must be exercised in the amount of heat that is applied and in the area of the gun that this method might be selected for. For example, while lamping the muzzle or bright spots on the cylinder of a M&P ·38 Special is acceptable, I would not recommend the same on a ·44 Magnum which is subject to many times higher pressures and stresses and which has a more sophisticated heat treatment of those parts.

In lamping such spots, clean the area thoroughly and lightly polish it with crocus cloth, feathering the edges of the bright spots into the original finish. Then, apply heat carefully, until the slightest trace of color begins to show up in the polished area, and immediately rub vigorously with a wad of soft, cotton cloth dipped in light oil. Examine the finish when it stops smoking, and if the color is not deep enough, wipe clean and repeat the process. Two or three applications will generally produce a satisfactory finish.

Almost any light oil will produce color when used in this fashion. I normally keep some number 10 motor oil for this purpose, but I've used almost anything that happened to be available at the time, including some bacon grease once. Actually, the bacon grease produced a nice pale blue. All the same, the oil you use should be a petroleum product, not one of the modern synthetics. Interestingly, the beautiful blue on Colt percussion revolvers was obtained by rubbing heated parts with fish oil!

Regardless of the oil or grease used, avoid overheating the part. This is just good practice regardless of the loads placed on the parts, but is absolutely essential where barrels and cylinders and similar heavily-stressed parts are concerned. Do not attempt to heat-blue small, highly-stressed parts such as sears, hammers, triggers, etc. You'll spoil their heat treatment.

If the gun you've decided to refinish has been nickel or chrome plated (or for that matter, plated with any other material), don't attempt to polish or abrade off the original finish. Sure, you can get it off that way, but it will take an enormous amount of work, and you'll actually be roughening the smooth steel under the original plating. Then you'll have to turn around and repolish it, and remove more metal and take the chance of spoiling more edges and markings in the process.

Instead, simply disassemble and thoroughly clean all parts, and then take them down to the nearest electroplating house and ask to have the existing plating stripped. It is a quick and simple process, and the price will be less than you'd expect. Once all the plating is removed, you can proceed with polishing as before.

RE-PLATING AND BRUSH PLATING

Re-plating is not something you can do at home. That is, you cannot do what I consider to be an acceptable job of re-plating a handgun. If you are an electro-chemical hobbyist, you can probably build a plating setup that will do a first-class job, but otherwise the most you can contribute is a superb job of polishing. After that, leave it up to the specialist, taking it to a good plating shop and explaining what kind of finish you want. Generally this means a hard, abrasion resistant finish where handguns are concerned, as opposed to a thin decorative, flash-plating job so often applied to other items. If you explain that you want heavy-duty plating, you'll get the right results.

What I've just said flies in the face of advertisements you've probably seen for home plating kits in various shooting publications. I've explored the capabilities of these kits and while they are quite useful, it is almost impossible to obtain a really good and uniform plated finish on a complete gun. All I've seen use the brush-plating process, and I've not found it possible to obtain a uniform coating over areas as large as are encountered in the average handgun. The largest piece I've seen successfully plated by an amateur in this fashion, has been an old Remington over-under ·41 Derringer. Anything larger needs to be plated by immersion so that the entire surface gets uniform coating deposits.

However, a brush-plating kit is a good investment for odd jobs. With it you can apply attractive and reasonably durable coatings of nickel, chrome, silver, gold, etc., to small parts such as sight blades, hammers and triggers, pin ends, extractors, etc. If your taste runs to gold or silver adornment of a blued gun, a $15 to $20 home plating kit will supply you with all sorts of fun. It may also be used to plate peeled areas of originally-plated guns lightly. The plating won't match the original finish in either texture, quality, or durability, but it will improve the gun's looks and prevent the bare area from rusting.

Another use for brush-plating is that already mentioned in regard to filling nicks, dents, or pits where it is desired to maintain the original surface level. With the average plating kit this is a slow and laborious process, but it is possible to fill pits and recesses by many repeated applications of nickel. Before the job is finished you may wish you'd never started, because the build-up is painfully slow. Once the area is plated flush or slightly above the original surface, it must be carefully dressed down perfectly flush, after which a new plated finish may be applied. A plated final finish is necessary because the nickel you've used cannot be blued.

BLACK CHROME PLATING

Aside from conventional bluing and plating there are several other alternative finishes which possess particular virtues.

Longest on the scene is black chrome plate which we've already mentioned. It, too, is something you can't expect to do yourself. There are a few shops which apply this finish, but Marker Machine Company appears to be the originator and principal source. It is a difficult process and requires careful attention. It cannot be applied to aluminum.

Marker will apply it bright and smooth, or in varying degrees of sandblasted matte finish, which I prefer. The coating is relatively hard and abrasion-resistant, though not as much so as bright hard chrome. It is highly resistant to rust, and this makes it ideal for guns exposed to high humidity. Several authorities recommend the Marker black chrome be applied to all parts of a hard-service gun, except the bore. The bore is then given Marker's hard chrome plate (their other specialty) and the entire gun is unusually well protected from all the elements. Preparation for black chrome is the same as for bluing or plating.

ARMOLOY

A more recent finish is the Armoloy coating applied by Armoloy Inc., mainly of chrome. It is applied electro-chemically by a special process which creates a molecular rather than mechanical bond which absolutely resists peeling. Even denting, cutting, or chipping the metal beneath will not cause it to crack or peel. It is also quite hard, harder than conventional hard chrome, and is used even on metal cutting tools for that reason. It is hard enough to resist a file.

Armoloy is available only in a very fine silvery-grey matte surface. This is a sort of smooth, frosted appearance which is quite attractive. Like black chrome, it can be applied to all internal parts without causing functional interference. A smooth polish job is required to prepare for Armoloy. The final matte surface must be done by the Armoloy shop, so don't try to jump the gun by sandblasting. Polish smooth and bright, and leave the rest to them.

There are other exotic and uncommon finishes, including black nickel, Teflon, and even some special epoxy paints, but they don't really interest us here. Yet they are advertised occasionally, and if one appeals to you, write for details and surface preparation instructions.

CHAPTER 13 - Finding, Making and Repairing Parts

For a modern gun that is still in production, or one which at least hasn't been out of production very long, replacement parts are generally readily available. There may be occasional temporary shortages, and there are those parts which manufacturers sometimes refuse to supply except for factory installation. But, in the main, parts are available without too much trouble.

One aspect of parts resupply that can be frustrating is the relatively small and short-lived repair parts supply that a manufacturer sets up or retains after discontinuing a particular model. I don't know just what standards they might adhere to in this, but it has not been unusual in recent times for the major parts supply to peter out after a model has been out of production only a few short years.

When new parts aren't available from any of the several sources herein elsewhere listed, it is still often possible to obtain used parts which may be either serviceable or repairable without great effort. Most gun shops and gunsmiths have a box or barrel full of discarded parts and often they can be placed back in service.

Then, we have the guns which have been out of production for so long that few, if any, replacement parts exist and those that do are tied up in the hands of parts specialists and carry a premium price. Usually by the time that situation exists only a few particular parts remain and others are unobtainable at any price. Even then, it is worth an inquiry to all of the parts specialty houses because from time to time hidden or misplaced stocks are discovered and enter the market. This has been known to happen even today with parts that were manufactured over one hundred years ago and just recently re-discovered.

The last resort for usable parts are the parts specialty houses which buy up old guns whenever they can and cannibalize them for serviceable parts. Most of these suppliers are honest and above board and, even though their parts are used, they will describe them accurately as to condition and serviceability. If they do send you a part that isn't up to snuff, they'll replace it quickly. Others get a little carried away and occasionally sell parts that are completely junk while describing them as "used, serviceable". Even these sources shouldn't be overlooked, for there are times when even a junk part can bail you out. If, for example, you have a gun with an unfamiliar part that is missing entirely, making it from scratch may be out of the question without a pattern. When that happens, even an unserviceable part can serve as a pattern or as a basis for rebuild or repair and thus get the gun back in service. But, before we get into making missing parts, let's take a look at the nature of the repairs that can be performed on parts that are broken or excessively worn.

REPAIRS BY WELDING OR RE SHAPING

In this respect, welding and silver soldering will be your greatest boon, augmented occasionally by brazing and, in the case of aluminum alloy frames and other parts, aluminum brazing. While outside welding sources can be used for this sort of work, unless the torch man is a gun buff himself, he won't really understand the problem and more often than not will not be accustomed to working on small highly stressed parts such as are common in handguns. So, the first time you encounter a situation where you must repair or rebuild an existing part, you had best invest in a small Oxy-acetylene welding rig. One I've found ideal for this type of work is the so-called miniature rig sold by the Brookstone Company for about $50. If you can catch this item on sale, you might obtain the oxy-acetylene torch with hoses and extra tips and also a set of air-gas tips complete for under $50. It will be one of the best investments you ever made, though because of its size, this outfit is not adaptable to heavy work. Of course, you'll need a set of regulators and tanks of oxygen and acetylene, but these can be rented locally.

But don't rush out and buy a welding rig and then immediately start to work on a small part. First check the welding and brazing chapter and also obtain a good handbook on gas welding. Then practice a bit on small pieces of drill rod, not greater in thickness than the part you'll be working on, until you feel confident that you won't botch the job.

One of the most common welding repairs is building up chipped out or worn off notches in SA revolver hammers. This job is typical of any requiring the building up of a fairly thick edge. Begin by grinding or filing or wire-brushing so that only clean bare metal is exposed in the area to be built up. Make sure to extend this area reasonably far beyond the broken sections to insure adequate backup metal for the new notches.

Set up the torch with a medium to small tip and select 1/16 or 3/32″ copper coated carbon-steel rod and get everything in readiness. Make up a wad of wet asbestos fiber and pack it around all parts of the hammer except the area to be built up, then clamp the hammer snugly, but not too tightly, in the vise. Use just enough pressure to hold the hammer firmly so you won't knock it loose while working, but not so much that the wet asbestos is compressed too tightly. It might be worth your while to pack up a little extra wet asbestos all around to help keep down heat transfer.

Next, with either a serviceable, identical part or a clear photograph thereof at hand, light the torch, adjust it to a clean neutral flame and preheat the area to be built up. When it is warm enough, move to one end of the broken area and quickly bring it to welding heat, moving the torch a bit so that area ahead of the weld being started will be held at near welding temperature. When the edge of the area is hot enough to coalesce, apply the copper-coated rod and work quickly to run a single layer bead over the entire surface from end to end. Quickly compare the amount of metal added to the photo or original part and, if further buildup is necessary, lay a second layer on top of the first. Repeat if necessary.

Don't add any more metal than is essential to allow the weld to be cleaned up to the shape and dimensions desired. The more welding done on the part, the more heat will be applied and bled down into the other areas. Before the weld is cool, check closely along the edges of the original surface and make certain you have slag free and bubble free bonding along the entire edge and that the weld extends out on either side far enough to allow grinding or filing flush with the original part. Then let the weld cool until all color has gone, when you can finish off by dunking it in water. This simply speeds up cooling and is not intended to do any hardening or tempering.

This done, take the part and very carefully grind or file the sides of the weld down until they are almost, but not quite, flush with the original surfaces and parallel. Finish the sides of the weld flush by careful polishing against abrasive paper laid on a flat surface. You want to get the weld down flush with the original surface without scratching or marring the latter, and this will take careful polishing.

Once the new metal is down to the proper thickness, lay another example of the same part over the one to be repaired, and pin and clamp them together in very careful alignment. With a thin pointed scribe, mark the proper profile on the side of the welded area. Be certain to follow every curve, notch, and angle precisely. A scribed line is difficult to see on a polished steel surface, so you'll be well advised to coat the area with layout blue or some other thin coating which will show them up and be easily removed later. As a last resort, a shot or two from a spray can of any bright or dark-colored paint will serve if applied very thinly. If you have any doubts about your ability to grind and file perfectly square with the scribed outlines, transfer the spare part to the other side and repeat the scribing operation.

Now all you need to do is file or grind away the excess weld metal outside the scribed line. Work over the other surfaces first, and save cutting the notches and indentations until last. When you come to the notches, use the finest needle files of various shapes to do the job, and don't hesitate to grind the teeth off of one or more sides of a file in order to avoid making the notch oversize. In fact, in filing the notches take care to leave them just a hair undersize and depend upon final polishing to bring them to exact shape and size. Simply polishing away the file marks will remove more metal than you realize, and it could result in oversize notches or weakened sections.

Once the weld has been filed to shape, use Brownell's flexible stones and thin slivers of hard Arkansas stone to polish all the edges and the insides of the notches smooth. Recheck profiles and notches against your guide to insure the best job possible.

At this point it's best to check the fit of the parts in the gun before hardening. In its unhardened state, the built-up area cannot withstand the stresses of normal functioning without damage, so it is necessary to remove all springs and other parts that would apply any undesirable load and then simply cycle the repaired part and its related ones by hand to insure that they will function, then make any changes, in shape or dimensions as are necessary. Following that, the built-up area must be heat-treated or hardened as described elsewhere.

The foregoing welding and reshaping process is applicable to a great many parts which may have small sections broken off or be excessively worn. It can be applied to hammers as just outlined, to triggers, sights, rebound levers, hands and, in fact, almost any part in the gun except springs.

Some parts, however, are much thinner in section than the hammer used as an example and thus require more careful torch handling. It is very easy to melt away what is left of a trigger nose rather than bring it to the correct temperature for building up more metal. If you are planning on building up a single-action revolver trigger by welding, then practice on the end of some short sections of 1/16″ drill rod or wire before you gamble your torch skill on that irreplaceable trigger or sear. If you can build up a modest lump on the end of a piece of 1/16″ wire without spoiling it, then you're ready for that trigger job.

Simply repairing broken parts isn't always difficult, but depends more upon the nature of the part and the stresses placed on it than anything else. For example, a spring-tempered autoloader extractor of thin section would be quite difficult to join and re-heat-treat if broken, but a plain pivoted extractor as found in the M39/59 S&W can easily be welded or silver-soldered together. Heavier, thick parts such as hammers, triggers, slides, etc. are easily silver-soldered and the greater the joint area, the stronger the repair.

Generally, any part not spring tempered can be silver-soldered together, and if the joint is carefully fitted and aligned the parts' dimensions won't change enough to interfere with fit or function. Work of this sort is described in detail under welding and soldering.

DEFECTIVE PINS

Some parts are often pinned more or less permanently together and the pins become worn or bent and prevent proper functioning. So, often the parts aren't defective, but are simply prevented from doing their job by defective pins. Removal of the old pins can be difficult because wear or bends in them may cause them to jam when being driven out, or may have allowed the parts to move out of register.

First, block the parts in proper alignment so the pin has a clear passage out. Tape, slivers of wood, epoxy, and other materials are useful for this. Then drive the offending pin out with a drift of slightly smaller diameter than the pin. Take care the punch doesn't hang up on an internal part and damage it. If the parts contain springs or the assembly involves springs, leave the punch in place after the pin is out. This will maintain alignment for installing the new pin and may save untold frustration in re-aligning parts.

Cut new pins to length from same size hardened drill rod and deburr and polish the ends. A slight bevel on one end will often aid insertion. Insert the pin from the back side, pushing the punch out as it enters.

Instead of leaving the punch in place, some smiths use slightly undersize slave pins to keep parts in alignment until the new pin is in place. They are inserted just like a new pin, pushing out the punch in the process, and are in turn pushed out by the replacement pin. The only real advantage to this is that it frees the punch for other uses.

In older guns, particularly, burrs turned up by wear or abuse interfere with functioning. This is usually a sign of poor material or heat treatment, or excessive use, but repair procedures remain the same. Simply removing the burrs will restore such parts to serviceability so long as their dimensions haven't been reduced too much. Sounds simple, but often too much metal is removed in the process, ruining the part. Use fine-cut needle files and stones to remove only the metal interfering with functioning. Don't get carried away and try to reshape the part. Don't grind, and don't use coarse files. Moderation is the watchword.

Modern DA revolvers contain a number of fixed pins or studs upon which certain internal parts rotate. Hammer and trigger studs are the most common and they are pressed tightly into holes in the frame. When they become bent, worn, or loose, they can be replaced but the job isn't easy. Removing the original stud requires driving or pressing it out from the opposite side, but unless the frame is carefully and solidly supported, it can be damaged by the force required. Removing a S&W hammer stud requires a shaped support containing a clearance cut for the stud. If this support isn't available, the frame will be bent, unless the stud is quite loose.

Replacing a stud is even more difficult, in fact, almost impossible without an arbor press or hydraulic press. Driving them usually isn't practical, since they are slender and easily bent, and hammer blows will upset the end. To do the job right, an arbor press and a guide bushing are required. Still, if one has a heavy bench vise with perfectly parallel jaws and makes a proper guide bushing, the job can be done, with care. Other pressed in pins and studs can be treated the same way.

ALWAYS USE THE RIGHT MATERIAL

With the exception of the very cheap pot metal guns, manufacturers make each part from a steel best suited to that particular use, and it is heat-treated for strength and durability. This doesn't mean they get carried away and use expensive, exotic materials, but that a suitable material is used, and one that is quite properly chosen with an eye on cost. After all, it would be ridiculous to use a special high strength molybdenum steel for a ·22 rimfire barrel when plain 1140 carbon steel costing far less does the job perfectly.

When making parts from scratch, don't use just any old big- enough piece of scrap that's laying around. For pins, screws and firing pins use standard annealed drill rod. It's probably better and stronger than what it replaces, but erring on the high side is good practice. For squarish or flat parts, use good oil-hardened tool steel available from Brownell's and other gunsmithing suppliers. Considering the amount you'll use, the cost is negligible, and you'll know not only the strength of the part, but you'll have specific instructions for hardening and drawing that particular steel. Certainly those conditions should produce the best possible part.

Whatever you do, don't resort to making firing pins out of nails or triggers out of box strapping and the like. In a pinch you can use scrap, but use it selectively. Broken twist drills make great pins, but a chunk of angle iron will make a lousy sear or trigger. Carriage bolts are soft as butter but good machine screws and cap screws can be cut into serviceable parts.

The best bet is to buy a gunsmith's assortment of round and square tool steel, plus one each of round and flat annealed spring stock right at the beginning. Those few dollars worth of steel will meet your needs for months, even years, and no single part will require more than a few cent's worth of material. Using the proper material makes the job not only easier, but the result more satisfactory.

MAKING THE REPLACEMENT PART

Making a major part from scratch may take time, even more than you want to spend, sometimes, but it is not usually technically difficult. Most major parts are mainly flat and can be shaped from ground, flat, tool-steel stock, available in a wide range of sizes and thicknesses. Take for example the hammer of a Starr percussion revolver—a part very difficult to find. The same procedures that apply to it can apply to any predominantly flat part.

First determine the part's thickness and general size. If you don't have at least a piece of the old part to measure, check the thickness of the slot in which it operates and the manner in which it functions, and published photos of the complete gun or its exploded view drawings. Then obtain a piece of flat stock as near the correct thickness as possible, rather too thick (by as little as possible) than too thin. Roughly locate the pivot hole in the stock and drill it undersize, then hand-ream or polish it to size.

Working from all the sources already mentioned, make a cardboard pattern. If you can't be sure of notch and hole locations, make instead a pattern of 1/16″ brass or aluminum and cut and try it in the gun until you have those critical points located. Orient the pattern on the stock and scribe around it. Now take a 1/8″ drill bit and with it as a guide, center punch completely around the outline, spacing punch marks 5/32″ apart and far enough out so that the 1/8″ holes won't quite touch the scribed outline. Set the stock on your drill press and next drill all those center-punched holes. So little will be left between the holes that a couple of hammer taps will knock the blank out of the stock. If they don't, a jeweler's saw or an abrasive-coated, metal- cutting wire saw will do so quickly and easily. You can, of course, cut the part out with a band-saw, or hog off the excess with a hacksaw and grinder, but drilling is less work.

At this point the new part may be a sorry sight, but it's rough outline is there. File and grind off the scallops left by the holes, then carefully dress down to the scribed outline, taking care to keep the edges at right angles to the sides. Before going further, locate additional holes (for example, for the hand pin and bolt cam) and drill undersize, then polish or ream to size. Locate and mark any ledges or undercuts and file or grind them to proper depth and shape.

Where a deep flat must be cut, time and sweat can be saved by using an end mill or spot facer in your drill press to hog away most of the excess. For this you don't need a milling table, just make overlapping vertical cuts, just like you were drilling a shallow hole. Do this up close to the edges of the cut and then finish with files. Lots quicker than with files alone. With this all done, rough cut the notches with needle files and Moto-Tool cutoff wheels.

From now on it's a matter of carefully bringing the notches to final shape so they function correctly. This means repeated cutting and trying in the gun or on a dummy block fitted with hammer and trigger pins. Once the notches are right, fit hand and bolt cam the same way. It takes time and patience, but you can do it.

You've saved the final external shaping and finishing until the last step in case you loused up the inside work. It would be a terrible waste if you'd spent a lot of time finishing the outside only to find the inside was wrong and had to be done over. Bring the outside down to the scribed outline, then do the beveling, radiusing, even sculpturing, found on the original, using small files and hand grinder. Cut the hammer spur checkering with the appropriate files, then carefully polish the entire part until all filing and grinding marks are removed. Stone the notches as slick as grease and use stones to break those wiry, razor- sharp edges inside. Now, stand back and admire your handiwork with pride. You've made a part from scratch just like the old master gun- makers!

Finish by polishing to the chosen degree of smoothness and brightness, then harden and draw, and the hammer is ready to restore that old six-shooter to service. The same procedures apply to any flat part, be it a trigger, hand, ejector for an auto, or even a locking bolt for an SAA Colt. The latter would merely require the additional operation of filing the slot between its two limbs.

All this sounds terribly time consuming, but it isn't nearly as bad as it sounds. A friend of mine who had never in his life carved a part from scratch made a very acceptable replacement hammer for a center- hung, box-lock muff pistol in less than three hours total time. First he had to convince himself there was no other way to get the part, then that he could do it! The rest was easy, just plain, finger-numbing filing.

But what about a part that is neither round nor flat? Fortunately, those that aren't either are usually a combination of both. An example would be the slide stop on a Radom Vz. 35 pistol, a complicated shape originally machined from a forging. You could file one from a big block of steel, but it would take days. Instead, look closely at the part. It consists essentially of a flat lever attached to the end of a long pin so, OK, make a flat lever and a round pin and fasten them together!

Just drill a hole for the pin in a piece of flat stock, then scribe the outline of the lever portion (properly oriented to the hole) and cut it roughly to shape. Silver-solder a length of proper diameter rod in the hole to form the pin. Now, shape the lever to function correctly, trying it in the gun as you go, and wrap the job up by cutting the pin to length.

Add localized hardening of the heavily stressed portions, and you've made a slide stop that will function as well as the original. If you work with reasonable dexterity and concentration, the entire job shouldn't take more than an hour and a half. That's a cheap enough cost to put a good gun back in service.

And so it goes. Other parts are usually combinations of shapes that can be made separately and then joined together. I once saw a perfectly serviceable copy of a Colt SA frame that had been made from layers of 1/8″ steel cut and filed to shape to form all the inner recesses and then finally hard-soldered together. A separate solid ring had been welded on up front to take the barrel. A Colt percussion loading lever could be made by welding or brazing flat stock on edge to rod; Ml Carbine trigger housings were once made by furnace- brazing layers of sheet steel together in a stack; a typical auto pistol thumb safety can be made from rod and flat stock joined. In fact, S&W makes both safeties and slide stops for the M39/59 in exactly that fashion.

FIRING PINS

Autoloader firing pins often give trouble that yields to fairly easy repair. Among exposed hammer autos, the protruding head of the firing pin often becomes burred or peened or "riveted" through excessive dry-firing or use. After a certain point, the head begins to stick in either the firing pin stop or the slide. Remove the pin and carefully apply a light hammer to the bulged and riveted area until it is forged down uniformly to original diameter and will move freely through its hole. Then dress smooth, gently radiusing the head, with files and stones. Finish the job by hardening and drawing.

A firing pin may also become jammed by peening or burrs on its surfaces where a retaining pin passes through, or on the retaining pin itself. Remove, clean off burrs, polish, harden and draw.

Firing pins sometimes become bent (who knows how) and jam in their recesses in the forward position. Under the right conditions this can cause a slam-fire and be dangerous. Careful straightening is the solution, and if the pin seems a bit soft and flexible, reharden and draw, but only after you're sure it will work smoothly.

Sometimes a jammed firing pin Will be due to either a broken or kinked retracting spring, or to a burred or peened firing pin hole in the breech face. Replace the spring if it is at fault, and ream or drill out the hole if it is causing the problem. Take care not to cut the hole oversize. If by accident you do, either bore out the breech face and install a hardened bushing, or make a new oversize pin to fit the hole with minimum clearance.

Pins in Browning-type guns with a firing pin stop slotted into the rear of the slide like the Colt ·45 auto offer other problems. The stop may become burred around the pin hole by excessive use and thus pinch and hold the pin out of reach of the hammer. Correct by carefully removing burrs and rehardening.

The stop may also be too loose in the slide and occasionally bounce out when the gun is fired, allowing the firing pin and spring to fly out and possibly injure the shooter. Peen the edges of the stop until it is a tight fit in the slide, and fit a new or more powerful firing-pin retracting spring.

You'll also occasionally run across a ·45 Auto slide which has been dry-fired extensively with the firing pin and stop removed as a safety precaution. During WW II this was often done. The practice turns up heavy burrs where the hammer strikes the slide and prevents entry of a firing pin. Just use a drill or reamer to open up the pin hole and the slide becomes serviceable again.

Hammerless guns generally have a large, hollow, striker-type firing pin with a lug protruding (a "bent") to engage the sear. This lug often becomes burred or chipped and can be repaired by welding as already described, or by grinding it down and silver-soldering on a filed-out new section like the original and you're back in business. This same type of firing pin has a habit of breaking its nose off. A very careful torch man can build the tip back up, after which it is filed and ground to shape.

Usually, though, an equally good repair can be obtained by drilling a hole back into the pin body, then silver-soldering a short piece of drill rod in the hole. Shape the new point to match the original and the job is done. If the firing pin hole is oversize, this is your chance for correction by making the new nose large enough to fill it.

Whenever building up or fitting a new firing-pin tip, it's usually best to make it a bit oversize, then carefully fit it to the pin hole with a minimum of clearance. Always, when repairing a firing pin by welding, reharden and draw. When a new piece is soldered on, use air-hardening tool steel and do not try to reharden.

Making a new auto firing pin from scratch is usually not too difficult. Most are round and easily turned on a lathe, on a Unimat, or—with care—by chucking rod in a drill press and grinding and/or filing to shape as it spins. The latter is a simple although slow method of making anything not of great length but round in section when a lathe isn't available. Lacking a drill press, it can even be done in a portable electric drill clamped in a vise or other solid holder.

Select a piece of drill rod of equal or slightly greater diameter than the largest section of the pin and chuck it tightly. Allow the length of the pin plus about 1/6″ to protrude from the chuck. With the drill running on medium speed, begin to shape the tip by running a sharp, new file across the rod, against the direction of rotation. Don't hold the file stationary, but use long, smooth strokes with just enough pressure so that it bites well. Using the old part or a sample as a guide, file 1/8″ to 1/4″ sections at a time to shape and size, progressing from the tip rearward. Several different sized and shaped files may be needed, depending on the outline of the pin.

When it looks and measures right, polish with a strip of abrasive cloth, then cut it off at the head, leaving a slight excess to allow final fitting. Try the pin in the gun and touch it up where needed. If the pin requires cuts or notches for retainers or crosspins, file them in next. Finish by shaping the head, and by hardening and drawing.

Often a Moto-Tool or other hand grinder will be more convenient than a file for this job. Use it gentle and be sure its rotation is opposite that of the chucked rod. A jury-rigged rest or guide will help a great deal with both files and the grinder.

If the pin required has external projections, but is otherwise turn- able as above, they can usually be made from small bits of tool steel and then be welded or silver-soldered in place as with some of the repairs mentioned earlier.

REPLACEMENT SPRINGS

Seems like springs give as much trouble as anything else. Handguns just don't work without springs, and some designs contain several. Generally leaf springs break, while wire springs (compression or torsion) just weaken or get kinked or bent.

Let's look at the wire variety first. They aren't hard to make if you have the right size wire available, but there isn't much need for doing so. Wolff Spring Co. offers such a wide variety of spring assortments that it is difficult to conceive of a coil spring need they can't meet. You might have to clip off a few coils, or stretch or compress one to fit, but they can furnish the basic springs. If there is a particular model gun you work on a lot, Wolff has a spring assortment to fit it, and usually specially designed individual springs as good or better than the originals.

Wolff also offers many leaf springs, some designed to fit particular guns, others of basic types and sizes which you can trim to meet a wide variety of needs. For example, there is a line of trigger return springs made for old top-break revolvers. With a Moto-Tool and files, there's hardly a gun around you can't take care of. So, don't try to make a spring unless you really have to. Get a Wolff catalog and obtain the assortments or items that appear most useful. To make a coil spring for, say, replacing the recoil spring of a Tokarev or French M1935 auto, first determine the diameter wire used in the original, outside diameter of the spring, and number of coils it contains.

Obtain the right size (or as close as possible) round spring wire and select a piece of drill rod a bit under the spring's inside diameter. Clamp rod and end of wire in a vise, then use a hand spring winder of the type Brownell sells to wrap the necessary number of coils (plus a couple more for good luck) around the rod. This spring winder is simple, costs little, and will save hours of frustration, so be sure to get one and use it.

Remove the soft spring from the rod, shape the ends as required with needle-nose pliers and cut it to the right number of coils. Now, carefully stretch the spring to approximate free length. Heating such a spring uniformly to give it the snap it needs is decidedly a chore. The most practical way I've found is to select a piece of iron pipe which will just barely accept the soft spring, and cut off a piece about two inches longer than the spring. Drill holes in one end so a piece of wire can be slipped through to keep the spring from falling out.

With spring in pipe, suspend it above a can of light oil; play the torch evenly over the pipe until it is cherry red all over; pull out the wire and let the spring fall directly into the oil. Fish the spring out quickly and drop it in a shallow sheet metal pan or tray containing just enough oil to cover it. Play the torch on the oil until it burns away, but do not play it directly on the spring. Let the spring cool, then compress it fully. The feel will tell if you've been successful. If you haven't, start all over.

Very thin fine wire springs should be formed cold from spring tempered wire. Experiment with different size rod until you find one that allows the wire to spring back out to the right diameter. Actually, most wire springs which can't be bought ready for use can be wound satisfactorily from tempered spring wire and used without any heat treatment.

There aren't many flat V-springs or single leaf springs in modern handguns except mainsprings (hammer springs), and in most cases replacements are readily available. If you're willing to try until it's right, you can make those tapered V-springs with hammer and anvil and a good heat source. Measure the greatest thickness of the broken spring at its V, then cut a piece of that size stock an inch or more longer than the entire spring. Mark the center with chalk, then heat to red and hammer-forge away from that point, tapering the separate limbs to proper thickness. Don't work it too cold or you'll spoil it. Leave the end at which it's held full size for future handling.

When it's forged about right, file, grind, and polish the tapered surfaces smooth, and trim excess metal off the sides until the limbs match the original. If there is a lip or engaging surface at either end, forge and file it to shape. Now, heat the center and bend and forge the bend to the proper angle and allow it to cool. Clean up the edges with files and polish. Don't leave edges sharp or burred. The last step is to heat the entire spring to dull red and plunge it into light oil, transferring it quickly to a shallow tray containing just enough oil to cover. Burn the oil off with the torch; the spring is finished when cool.

If you have difficulty heating the formed spring uniformly for quenching, just lay it on a piece of steel plate and heat the plate until the spring has the proper color. Then quickly knock it off into the oil.

Single-leaf springs can be made the same way, but it's usually easier to grind and file them from tempered flat spring stock. Take care to avoid overheating while grinding; polish them smooth lengthwise to preclude crosswise scratches which might cause breakage under stress.

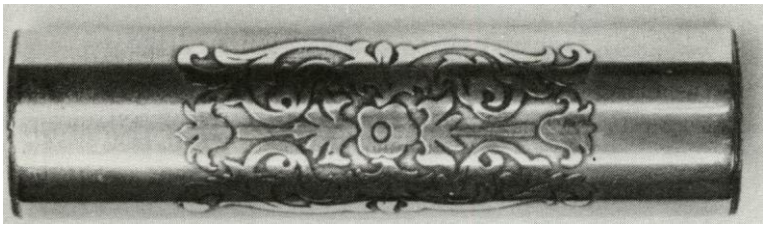
There are other parts repairs that will occur, but they embody the basic procedures already outlined. If you'll take time to look the job over carefully, you'll see what must be done.

CHAPTER 14 - Stippling, Checkering and Ornamentation

Unless you're a skilled engraver or experienced in metal inlay work, there isn't really all that much you can do to ornament your handguns after the plating, bluing, and restocking covered elsewhere. Some of the functional alterations already mentioned, such as matting and checkering, do serve decorative purposes, in a way, and there are possibilities in combining them with simple etching, or even overlay work.

ETCHING

Etching is merely the use of acids to eat away background metal to form either a design in itself, or to leave raised areas which form the design. It involves coating the part to be etched with an acid resistant paint or varnish (usually called "stop varnish") and then removing the coating in the areas to be treated. Acid is then applied and allowed to deteriorate the exposed metal for a period of time, then washed off thoroughly. Unfortunately, that is an oversimplification of the process that has tempted many an amateur into spoiling a good gun.



When carefully executed, etching can produce clean, sharply-defined patterns such as on this section of barrel.

The mechanics of etching are deceptively simple; the details are not. Two things are very important to etching. First is a perfect job of applying the protective coat without bubbles, voids or thin spots through which the acid can attack wrong areas. Second is clean, sharp formation of the design in the coating, without fuzzy edges, cracks, chips, overruns, etc. It is also necessary to remove the coating thoroughly where the acid is to work. Beyond that, the result can be no better than the artistic quality of the pattern. Then, too, one of the most common mistakes is the use of too little acid or a solution too weak or too strong.

Let's say you want to install something simple such as your initials or a monogram on the side of an autoloader slide. First, the part must be thoroughly clean and free of grease, and if rebluing is on its schedule, the polishing should be completed. Coat the entire area to be decorated thinly and uniformly with stop varnish. No lumps or bubbles.

Stop varnish can be obtained from jewelry supply houses, or you can make your own from mastic, white beeswax and pulverized asphalt in a 1-1-2 mix. The three ingredients are melted together and mixed thoroughly, then cooled into cakes. For use, slivers or scrapings are dissolved in turpentine. Other formulas exist, but this one seems most preferred. It is applied smoothly and evenly with a soft artist's brush and allowed to dry thoroughly.

Trace the design in reverse on a piece of thin celluloid or similar transparent plastic with a smooth, sharp pointed scribe. Make certain the design will be facing properly when transferred to the gun. Dust the scribed outline with white talcum powder, then wipe off the excess. The scribe marks should remain filled with powder.

Next, turn the pattern over, scribed side down, (see why it was scribed in reverse) and position it carefully on the part. Burnish the back of the pattern firmly, but not too hard, transferring the powder to the varnished surface. Lift off the pattern carefully to avoid breaking the coating, and the design will be outlined in talc on the part.

Use narrow, smooth, sharp scrapers, and sewing or phonograph needles, to remove the varnish inside the outlines completely. If you want shading in some areas, merely mark thin lines through the varnish with a knife edge or needle point. All tools must be polished as smooth as possible and fitted to small wood handles for ease of control. Blow or lightly brush away any varnish fragments. If you've messed up a spot, recoat, and when dry, recut. Examine the entire area with a magnifier to make certain the design is as clean and sharp as can be made.

Use softened beeswax to build up a fence or dam completely around the area to be etched. Make it high enough to accommodate 1/16-inch to 1/8-inch of acid over the highest point of the design, with enough safety factor that acid won't be splashed or sloshed over the edge. Make sure to use a fixture or clamp to hold the part solidly so it won't be knocked about to spill acid later. A big block of clay works well; just partially imbed the part in it, leveling the design area so a uniform head of acid is maintained.

In mixing the acid, use a clean glass container. Pour in the water first, then add the acid carefully, flowing it down the container wall. Use rubber gloves, apron, and goggles. Mix a 15 percent solution of nitric acid and treat it gently—it bites!

This is a weak solution to practice with. Once you've learned what it can do, a stronger acid mix may be used, all the way up to 1-1 water-acid (nitric). But until you've had lots of experience better stick with the weaker solutions—nitric acid eats steel fast. If quite hard steel is to be etched, substitute a mixture of three parts nitric acid and one part acetic acid, but don't try this more corrosive formula until you're sure the nitric/water solution won't do the job.

When the acid solution is cool, use a large glass pipette or a glass syringe to transfer the acid carefully to the design. Don't under any circumstances, try to pour the acid. Add acid inside the fence until there is at least 1/16-inch above the highest part of the design. It will boil and bubble a bit, then simmer down. Don't breathe the toxic vapors.

How long the acid is allowed to work depends upon how deep you want the design made. It's best if you make a test run on a piece of scrap steel first to learn what is required to get the effect you want. If it goes too far, the metal can't be put back. If in doubt, flush the acid off with water and examine the work closely. If it isn't deep enough, add fresh acid to work a little longer.

It is a mistake to try to etch too deeply. Past a certain point the acid starts cutting back from under the varnish, wiping out parts of the design and producing irregular edges as well. Some practice on scrap steel will show how far you can go and still get clean edges and outlines.

After the acid has done its work, wash the entire part thoroughly to remove it, then remove the stop varnish. Don't scrape it or the surface might be damaged; use solvent (turpentine) and an old toothbrush. A professional might next clean up some areas and outlines with engraving tools, but without engraving experience, I'd recommend you not try. You might try light burnishing with steel wool or a small wire brush in a Moto-Tool, but no more. You can also stipple or matte the background area with small punches for interesting effects.

Etched designs may be left bright if done through existing bluing, or may be blued with the rest of the part. If the original finish is intact, the acid treated areas can be blued with any good cold blue applied carefully with small cotton swabs.

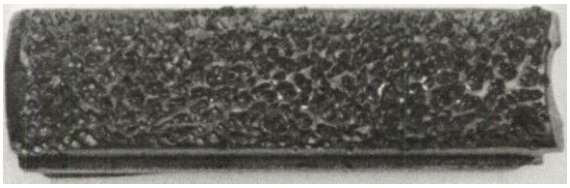
I've seen some etching jobs on which the background has been filled with the gold or silver lacquer sold for "inlaying" markings and serial numbers. Done in moderation this sometimes looks nice, but it depends upon the design and the quality of the etching.

ENGRAVING

In my mind, well executed engraving in scroll and floral patterns is the ultimate in handgun decoration. Unfortunately, I can't do it. At least I lack the artistic talent to make it look right. Mechanically, engraving is quite simple, but years of practice and an artist's eye are absolutely essential to producing a decent job. Hence, all I can suggest here about engraving is to obtain books on the subject and study them well. After that, if you want to gamble a good gun, have at it. Quite a few competent amateur engravers started out just that way.

STIPPLING

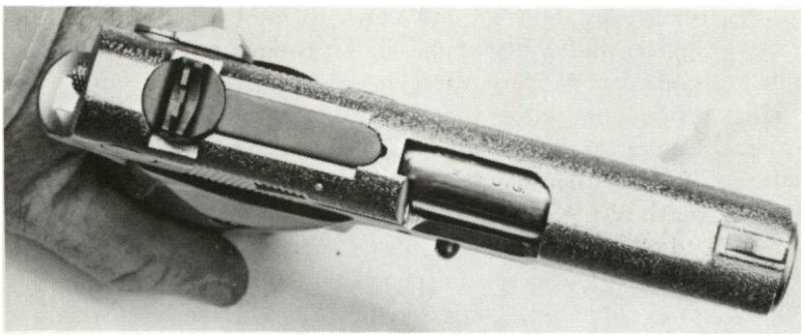
Almost from their very beginnings, the front and backstraps of revolvers and autoloaders have been smooth, polished metal. They look great, but are too slippery. A secure grip is not only essential for target shooting, but for defense use as well and smooth surfaces do not supply it. While carefully executed metal checkering works well for these surfaces, its application is generally beyond the ability of the average amateur pistolsmith without a lot of experience. The finely executed metal checkering seen on custom-made guns is mastered only after a great deal of practice and experience and often it is machined rather than hand-filed.



A typical conventional stippling job done on a Government Model mainspring housing, where a simple pyramid-point punch is used to indent the entire area and thus produce a rough surface for more secure holding.

A much more practical slip-proof surface, and one which can be done reasonably well by almost anyone, is stippling. Even stippling can take several forms, but the form most common and easiest to accomplish is produced by using a small punch with a point forming a 45 degree angle pyramid. The punch point should be polished smooth on all four of its sides, stoned to an extremely sharp point, and be quite hard. If the point becomes dull, the result will suffer.

Stippling is easily done with a light hammer, the frame secured in a heavy vise. When the surface to be stippled is reasonably level and easy to reach, hold the punch firmly in your left hand, vertically between thumb and forefinger, and rest the heel of your hand upon the jaws of the vise. Tense the muscles of your hand and hold the punch point about 1/4 of an inch above the surface. Sharply smack the punch to produce a pyramidal dimple. The spring action of your tensed hand will automatically withdraw the punch. If the punch is pressed down against the metal, it will bounce up, rebound from the hammer, and make a secondary dimple that isn't usually desirable.



Stippling need not be as sharply done as it generally is to provide a more secure hold, but may also be applied lightly, as shown here, to reduce glare of bright surface.

While it is possible to strike each blow precisely and eventually produce a fine stippling job, it takes a great deal of time. A far better method is to strike rapid, consecutive blows, slowly moving the punch so that individual dimples partially overlap. With practice, this method is easily mastered and you can completely stipple the front strap of a ·45 auto in about five minutes, or even less. I prefer to overlap punch marks about one-half, but some individuals prefer either a finer or coarser pattern.

A much sharper-toothed surface can be produced by angling the punch about 45 degrees so that its point bites into the metal and turns up a sharp burr ahead of it. With this method, each blow should be struck individually, and punch marks should not be overlapped but spaced apart about one-half of their diameter. By varying punch point shapes, the angle at which the punch is held and the amount of overlap, a wide variety of patterns can be produced, and the surface can be varied from only mildly rough to very sharp and abrasive. Practice first on scrap steel and you'll soon be able to decide the stippling effect preferable.

SERRATIONS AND METAL CHECKERING

Lateral serrations can be just as useful in producing a secure grip; they are seldom used but will make a gun unusually attractive. I prefer to use a standard metal checkering file of about 26 to 30 lines per inch. Coarser patterns may be used, but do not go below 18 lines per inch. On single-curved surfaces, such as the front strap of a Colt ·45 auto, the entire width of the checkering file may be used, however, for compound-curved surfaces, such as the front and backstraps of some revolvers, the file must be ground down so only three or four lines remain. Using the full width of the file on compound-curved surfaces results in a great deal of overlap and crossing lines.

First, scribe a line across the surface at right angles to the sides of the frame. I prefer to put this line at the right end and work from right to left, but it doesn't matter. Then, as outlined in the chapter on filing, the entire width of the checkering file is used to mark grooves lightly, parallel to the scribed line. The file is then rocked slightly to the starting side, and grooves are deepened until the beginning ones are deep enough to serve as a guide for the rest. The file is then shifted over (left, in my case) three or four lines, and the process is repeated until the entire area is covered with half-cut grooves. Then, with the file held level, go back over the whole surface, shifting one groove at a time, until grooves are full depth, and the lands are all sharply pointed and of uniform height. Light burnishing with a clean, soft wire brush completes the serrating job on single-curved surfaces.

The same procedure applies on compound-curved surfaces, but a much narrower file must be used, no more than four lines, often only two lines. On sharply bent surfaces, even a single-line may be needed to finish the grooves uniformly. Actually, many gun tinkerers prefer to use a three or four-line file for all surfaces, feeling that it is easier to maintain alignment when only a few grooves are being cut simultaneously.

Should you want to try checkering these same surfaces, you're in for a more difficult and time consuming job than serrations. Essentially, checkering is formed when two sets of parallel grooves are filed, one crossing the other at an angle, just as in checkering wood.

On simple curved surfaces, little difficulty will be encountered in checkering the main part of the area to be covered. Just cut the first series of parallel lines lightly, then cross them with the second set and cut both sets progressively deeper until the diamonds formed by the intersecting lines are brought to a point.

The edges and ends of any such pattern, however, present substantial difficulties until one gains a good deal of experience, not only with the checkering tool, but with a graver, and the fine, triangular, die-sinker's files which are needed to carry a groove to an abrupt halt at the edge of a pattern. It is impossible to terminate the upper edge of a front or backstrap pattern in fully formed diamonds without running the lines over when using only a checkering file.

Finishing to a curved border requires the use of a graver or chisel, since curved lines cannot be cut satisfactorily with a file. It is far simpler to finish with a straight border across the upper end of the surface, cutting a single groove to establish that border first and then bringing the two sets of lines up to the outer edges of that border with a three or four-line file, then carefully working inward with the very tip of a two-line file, right up to the border groove. The checkering may then be finished to a straight border with a single-line file, after which only a little cleaning up of the ends of the grooves at the border is necessary with a triangular file.

Once an area is completely checkered to the depth desired, its texture and finish can be improved by careful burnishing with a soft wire wheel, or a soft iron wire brush wielded by hand. Excessive power brushing will round the diamonds and edges too much, so care must be exercised. The wire brush should be applied lightly and only until burrs and feather edges are removed and the points of the diamonds are blunted ever so slightly.

Actually, a creditable job of checkering requires a great deal of patience, skill, and experience. Simple lateral serrations are much simpler and the cautious, patient person shouldn't find them too difficult.

Vertical serrations are found on the fronts and backstraps of many handguns. These are normally machined in with special tools during manufacture. The home 'smith can approximate them in form and function with files and gravers applied carefully.

The first step is to hold a flexible straight edge against the surface as a guide, and scribe the groove locations very carefully. Spacing should be precise and uniform, and the margins at the sides should be equal. Once the pattern is laid out properly, re-scribe the lines deeply and sharply, keeping them straight.

If you've a V-point graver and a little experience in its use, use it to deepen each scribed line. If not, though, stick to files. Take a small, triangular, bent needle or die-sinker's file, and carefully deepen each scribed line with short, overlapping strokes. Don't try to cut one groove full depth, then going on to the next. Instead, deepen each in succession only a couple thousandths of an inch, then go over them all again, this time cutting a bit deeper.

As the lands between the grooves become narrower, straighten out any little bobbles that become evident by filing a bit more to one side or the other. As the grooves deepen you want to finish up perfectly straight, sharp ridges between the grooves. This will take a while, but the result is worth the effort. Finish such vertical serrations by vigorous wire brushing, parallel to the grooves, to burnish and polish the filed surfaces. But in my opinion, vertical grooves aren't nearly as functional as sharp stippling, and since they are more work than lateral serrations I seldom use them.

MONOGRAM SHIELDS, ETC.

Not much else can be accomplished in the way of handgun decoration except, possibly, the installation of silver or gold monogram shields or objects. Thin metal shields with your name, initials, or monogram are economical and readily available. They can be attached to the gun without much trouble.

A typical job starts with marking the location on the gun, then removing the original finish inside that outline. Next, coat the surrounding area with anti-flux and tin the contact area carefully with good soft solder.

File or polish the back side of the shield smooth, clean and flat, and reduce its thickness as much as you safely can. Tin it also, then clamp it in place on the gun, and heat it just enough to flow the solder. Quickly wipe away any excess squeezed out solder, then cool and clean. If you've worked cautiously, the blue will not be harmed in the least and only a very faint line of solder will show between the shield and gun. Wrap up the job by polishing the gold or silver shield with jeweler's rouge.

Having artistic talent, you may cut animal heads, monograms, or other decorative items from silver or gold sheet and apply them in the same way. Remember, though, that soft solder is dissolved by most hot bluing solutions, consequently any future refinishing will remove such overlays.

Beyond this, you'll either have to learn metal-smithing arts, or seek out a professional to further decorate your guns.

CHAPTER 15 - Correcting Excess Headspace

Shooters generally worry less about headspace in autoloading pistols than they do in rifles or shotguns. They automatically assume that if there is a problem, the condition will take care of itself, even when a new or used replacement barrel is installed.

Granted, new guns are usually quite correctly headspaced, and new replacement barrels obtained from the original manufacturer generally meet the same requirements. However, there are manufacturers of replacement barrels who may not always adhere quite so closely to the original specifications, and there is also a thriving market in used and new replacement barrels salvaged from the world's military surplus market. The result is often a fair degree of excess headspace.

EFFECTS OF EXCESS HEADSPACE

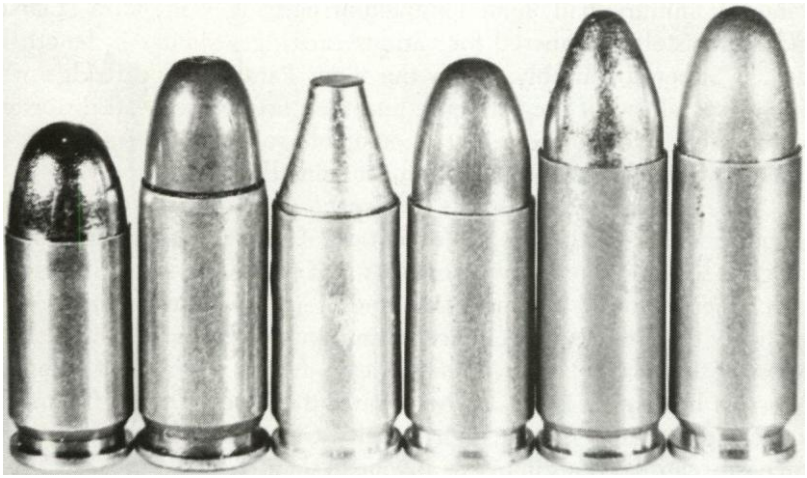
What is the effect of excessive headspace in an autoloading pistol? Generally not much in the case of those guns using long, slender firing pins with virtually unlimited protrusion, such as the Browning, Colt, Walther, Radom, and similar designs. In them, even if the case head seats a full 1/10 of an inch forward of the breech face, the firing pin will still protrude sufficiently to fire the cartridge.

In pistols with limited firing-pin protrusion, the Luger/Parabellum being a common example, greatly excessive headspace will result in misfires. In the Luger, the cartridge is stripped from the magazine by the lower lip of the bolt face and driven into the chamber without being engaged by the extractor until the final instant as the bolt halts against the breech face.

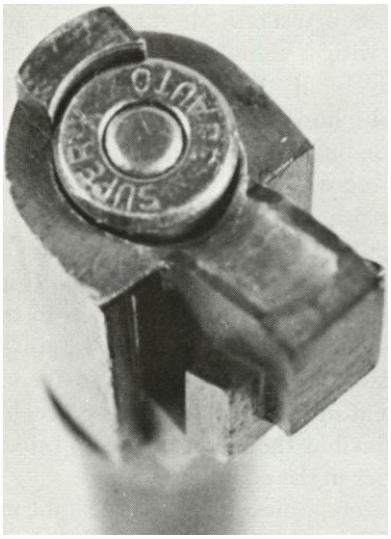
In this instance, with excess headspace, a cartridge will be driven into the chamber ahead of the extractor claw, and will actually be held there by the extractor pressing against the rear edge of the rim, opening up a space between the primer and the bolt face. Unless firing- pin protrusion is substantially greater than that distance between the primer and the bolt, a misfire will result. I've never seen a Luger or Parabellum pistol fitted with an original commercial or military barrel with enough excess headspace to produce misfires, however, I have run across a couple of rebarreling jobs where the chambers were deep enough to give that problem.

In guns having sufficient firing-pin protrusion to do so, firing a cartridge under conditions of grossly excess headspace will produce all the evidence of tremendously excessive chamber pressure: the primer will be severely flattened and perhaps perforated, the headstamp may be partially ironed out by the breech face, the case head will be expanded, the primer pocket will be expanded, and in extreme circumstances, the entire case head may be distorted or even ruptured. When you analyze this situation, it's really quite simple. If at the instant of firing the case head is not supported by the slide breech face, the case is driven rearward just as fast as the bullet is driven forward by the expanding gases, perhaps even faster because it is much lighter than the bullet. The case is accelerated rearward and then abruptly slams into the immovable slide, and the brass case head flows under the impact, just like butter. The effect is the same as if you took a roundhouse swing at a case head with a hammer.

Probably the classic and most severe example of this occurs when a 9mm Parabellum (Luger) cartridge is fired in a ·38 Super, 9mm Bergmann-Bayard (Largo) or 9mm Steyr chamber. If the relationship of the cartridge and the chamber is loose enough, and the cartridge slips forward to headspace on the chamber mouth, then roughly ·150 of an inch excess headspace exists. When the gun is fired, the firing pin bridges that gap and detonates the primer, and the case is driven rearward at very high velocity to slam into the solid breech face. When that happens, the relatively soft and weak brass comes unglued.



On the right are the long 9mm cartridges whose chambers will accept the shorter rounds on the left. The amount of excess headspace that is produced by firing the short cartridges in the long chambers is obvious—and it can cause ruptured cases.



This chamber shows considerable excess headspace where the case head comes to rest substantially beyond the rear face of the barrel tang.

I have conducted extensive experiments on this problem by firing standard military ball 9mm Parabellum cartridges in Astra, Llama, and Star pistols chambered for various cartridges similar in length to the ·38 Super. Invariably, when the 9mm Parabellum cartridge was chambered ahead of the extractor, and then fired, case head distortion was massive, even to the extent of complete rupture and fragments of brass blown back through the action, jamming the pistol.

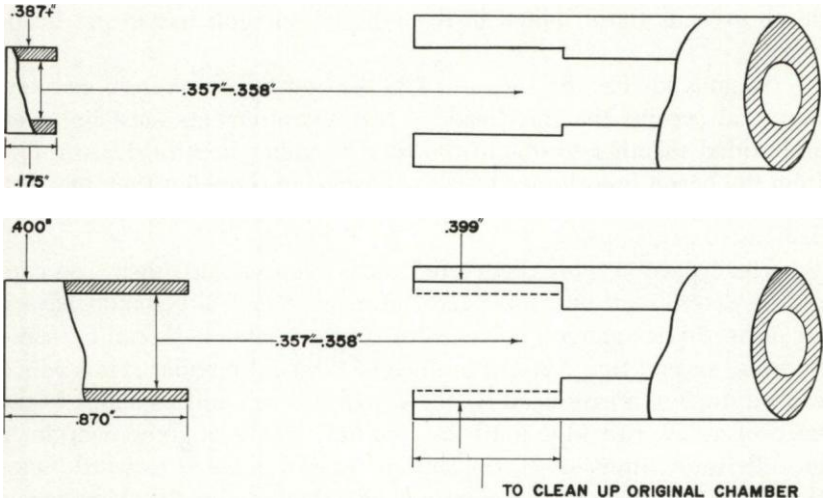
The reason such excessive headspace is seldom noticed by the casual shooter is that, with the exception of the Astra M400 pistol, all the guns so chambered have extractors that pick up the case by its rim as it emerges from the magazine and it is thus usually held back relatively close to the breech face, even though over 1/8th of an inch of excessive headspace exists. While a case failure (blow out) due to excessive headspace is not likely to harm the shooter, brass fragments and hot gases emerging at high velocity from the gun's ejection port can easily cause serious injury to anyone in their path.

CORRECTION IN AUTOLOADERS

So how do you correct excessive headspace in an autoloader? If you have access to several barrels, it is often possible to selectively fit a particular barrel that will produce near-optimum headspace. Lacking this, the only practical method is to first ream out the front of the chamber and then insert a short bushing, which is then cut successively deeper with a chambering reamer until chamber depth is correct. Alternatively, if the barrel walls are thick enough, the entire chamber may be bored out, sleeved, and a complete new chamber cut in the sleeve or bushing. In many instances, this method weakens the barrel breech more than I like, so I much prefer the short bushing at the front of the original chamber.

Theoretically, it is possible to build up the locking lugs or their seats by welding or plating and then recutting them so that the barrel is moved somewhat rearward in relation to the slide, thus eliminating the excessive chamber depth. However, this job usually requires the skills of a master machinist. I have also seen excessive headspace corrected by sweating or silver-soldering steel shim stock to the slide breech face; this has the effect of placing that face closer to the head- spacing shoulder in the chamber.

Unfortunately, unless only a very slight amount of buildup occurs, this fouls up the extractor/breech relationship and requires cutting back the barrel hood or tang on Browning-style designs. It would be entirely practical on a Luger, P38, or Beretta M51 where the affected area does not contact the barrel breech and where the simple hook- type extractor is easily opened up to compensate for the added thickness.



Top shows short bushing used in 9mm Bergmann chamber to shorten headspace for 9mm Parabellum; bottom shows bored-out 9mm chamber and bushing into which new chamber is reamed to proper headspace.

There is yet another method of correcting headspace, which is not economically practicable unless you are also prepared to pay for relining the bore. In this case, a completely new bore surface is placed inside the barrel, and then it is rechambered to the depth for correct headspace.

Determining correct headspace requires either headspace gauges, something few of us possess in handgun calibers, or an accurate vernier caliper or depth micrometer reading up to one inch. To gauge headspace in Colt/Browning-type autoloaders where the barrel is positioned by a hood at its top which engages the slide breech face, simply measure from the rear face of that hood to the headspacing shoulder in the chamber. Compare that measurement to the proper dimension listed in the tables in this book and you will readily see whether your chamber falls within industry standard specifications. If the chamber depth exceeds those shown in the tables, your gun has excess headspace.

In guns such as the Luger or P38 the bolt face contains a counterbore that accepts the case head, so two measurements must be taken and added together to obtain the total chamber depth. Measure first from the barrel breech face to the headspacing shoulder, then measure from the rim of the breech face (the part that contacts the barrel) to the bottom of the case head counterbore, then add the two together. A few older guns such as the M96 military Mauser and its variations virtually defy headspace checking without proper gauges. There simply isn't any practical way to measure total chamber depth with common instruments.

Headspace in guns chambered for bottleneck cartridges also cannot be determined by simple measurement. You really should have a set of headspace gauges, however, an approximate check can be made by using several thin (·002 of an inch or thinner) circular shims which can be stuck to a case head by thick grease. Keep adding shims to the head of a new cartridge until the gun fails by the slightest margin to go fully into battery when the slide or breech is eased forward. Once this no-go point has been determined, the thickness of the shims represents the approximate amount of excess headspace existing. You can be more accurate by repeating this operation with a number of cartridges from different manufacturers and manufacturing lots. Once the data has been compiled for eight or ten cartridges, compute the average.

Usually, maximum allowable headspace is approximately ·006 of an inch more than the maximum length of standard cases. Using this as a base, if we find a 7·63mm Mauser or 7·65mm Luger that accepts a cartridge with more than ·006 of an inch of shims on its head, we can safely say that gun has excess headspace.

The only practical method of correcting excess headspace in bottleneck chambers in those guns not having the barrels screwed into a barrel extension or receiver is to bore out the chamber, press in a bushing, and cut a new chamber. Of course, relining also allows complete correction of any excess headspace condition and, a relatively slight correction can be made by building up the breech face with soldered-on shim stock. In the Luger or in some altered M96 Mausers where the barrel is screwed into the barrel extension, the barrel may be set back one thread, be turned that much deeper into the barrel extension, and its chamber recut to the proper dimensions.

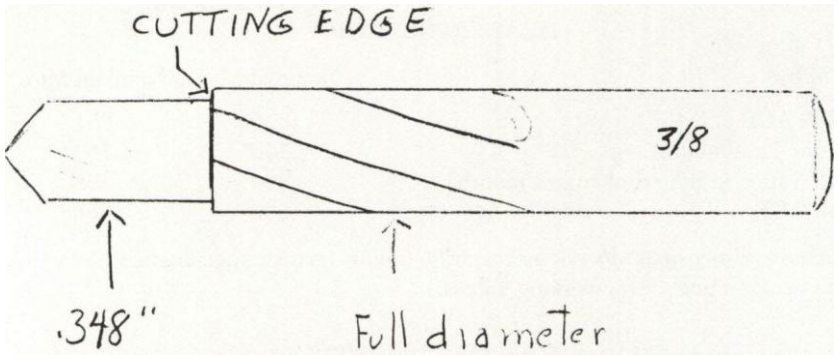
Let's review the various ways of accomplishing headspace corrections, beginning with the chamber insert. Dimensions are given in the accompanying table for inside and outside diameters of chamber-insert bushings to be used in the various calibers, however, the length of the insert depends upon how you wish to go about the job. For example, for shortening a 9mm Bergmann-Bayard (Largo) chamber to 9mm Parabellum (Luger), the insert length is ·150 inch. In this instance, the chamber is thoroughly cleaned and degreased with acetone or similar solvent, then the insert is pressed or driven into place until it meets solidly against the original headspacing shoulder. If you have a 9mm Parabellum chambering reamer, it is good practice to make the insert a bit long, and then use the reamer to cut it down once it is in place so that the actual depth of the new chamber falls within the specifications listed in the tables.

HEADSPACE TABLE		
Caliber	Nominal Min.	Nominal Max.
·380 ACP	·675″	·681″
9mm Parabellum	·750″	·760″
·38 Super (squared chamber mouth)	·890″	·898″
·45 ACP	·890″	·898″
(Above dimensions do not necessarily follow factory specifications exactly, but are practical, safe, working values.)		

If a 9mm Parabellum barrel has ·020 of an inch excess headspace, it isn't practical to make an insert so short, nor will so short an insert likely stay in place. Therefore, we must deepen the chamber to make room for an insert of reasonable length, say 1/8th of an inch. This can be done by very careful use of a twist drill which has been altered as shown in the accompanying drawing and fitted with a bore-riding pilot.

First, measure the depth of the original chamber, then add the length of insert you wish to use to the length of the case, and attach a stop to the drill to limit its cutting depth to that dimension. Then, with the barrel in a vise and using ample cutting lubricant, run the drill at the slowest speed which your variable-speed drill allows until the chamber is deepened to the amount needed. With the chamber thoroughly cleaned and degreased, measure depth again, and drive the insert into place with a brass rod, one that will just barely enter the chamber.

If all dimensions have been properly calculated and the drilling has been precise, the gun may now be assembled and fired. However, I find it more practical to make the bushing insert at least ·030 of an inch too long, and after it is in place, I use the same drill to deepen the bushed chamber progressively until the action of the gun will just barely close on standard cartridges. Of course, if a set of headspace gauges is available, they should be used rather than cartridges.

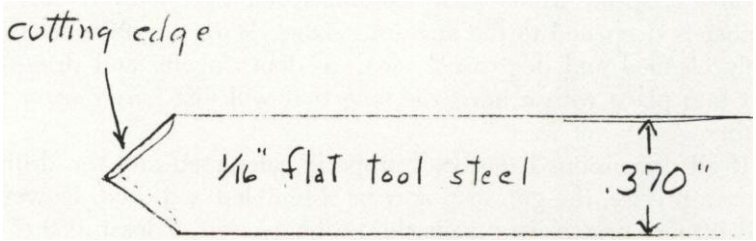


Showing 3/8″ drill altered to deepen 9mm chamber.

Occasionally, driving the bushing in place will turn up burrs on the rear edge of its bore. These will dig into bullets and thus prevent proper chambering. They can easily be cleaned off, using the pointed scraper-like tool shown in the drill sketch.

If you have made the bushing's diameter too large, forcing it into that tight hole may have compressed its bore diameter so that it will not allow a bullet to pass through freely. In that case, it may either be lapped out with a brass rod and valve grinding compound, or it may be polished out with a thin, slotted, mandrel fitted with flaps of abrasive cloth or paper in your hand grinder.

This method of correcting excess headspace gives the bullet an additional 1/8th of an inch of freebore which is reputed to decrease pressures, or increase velocities, or both. While I doubt that this amount of freebore produces any significant velocity gain, I've conducted tests that indicate larger amounts of freebore definitely do reduce pressures and increase velocities somewhat.



Scraper for removing burr at rear of chamber bushing.

For a more workmanlike job, substitute a proper reamer for the drill to deepen the chamber. In my own case, I had purchased a ·38 Super chambering reamer many years ago for a re-barreling project, and have since used that reamer for every 9mm/ ·38 headspace correction job that has come along. I have also owned and used a ·45 ACP reamer for many years. However, I do not think the price of a new reamer could be justified to correct the headspace on just one gun, thus the drill is probably the most practical means.

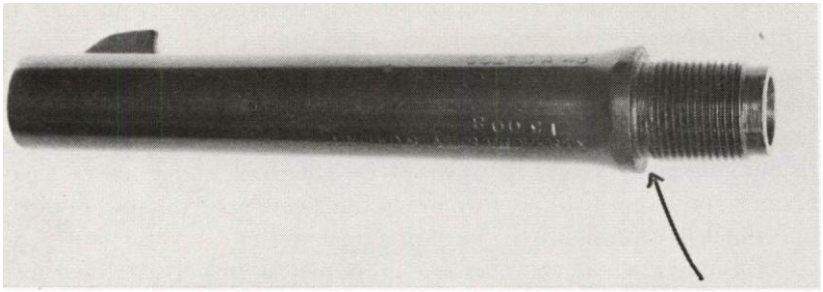
Bushing a whole chamber is another matter entirely. It, too, can be done without a lathe or expensive power tools other than a drill press and Unimat. Because of the thinness of the barrel walls, however, this method is not usable in ·45-caliber guns, and not generally in ·380 ACP caliber.

To begin, drill out the original chamber to a depth of approximately 1/16th of an inch greater than its original depth, and also turn a new chamber bushing. Tin the bushing's outer surface and the chamber portion of the barrel with soft solder. With the barrel warm and the bushing cool, quickly drive the bushing into place, making certain that it seats completely to the bottom of the chamber recess. Then heat the assembly just enough to melt the solder thoroughly and allow it to penetrate throughout the joint. Add solder to its rear if any gaps appear. The operations of cutting the new chamber, cleaning up the breech, and shaping the feed ramp are accomplished as described under the subject of barrel relining elsewhere in this book.

Setting back a screwed-in barrel need not require a screw-cutting lathe. Since no more than one full turn is involved, the barrel's shoulder may be faced off by very careful filing, after which a clearance groove as illustrated is filed to the depth of the original barrel thread. This will then allow the barrel to screw fully into the barrel extension without interference. The loss of that one thread produces no measurable reduction in the strength of the union.

After the barrel has been set back, the rear of the barrel breech must be faced off an amount equal to one thread, and the extractor cut (if present) deepened the same amount. All of this can be done by careful filing and use of a hand grinder. Following this, it is necessary to run a chambering reamer into the original chamber and deepen it by very light progressive steps until the chamber will either accept a "go" headspace gauge or an assortment of factory ammunition in the proper caliber.

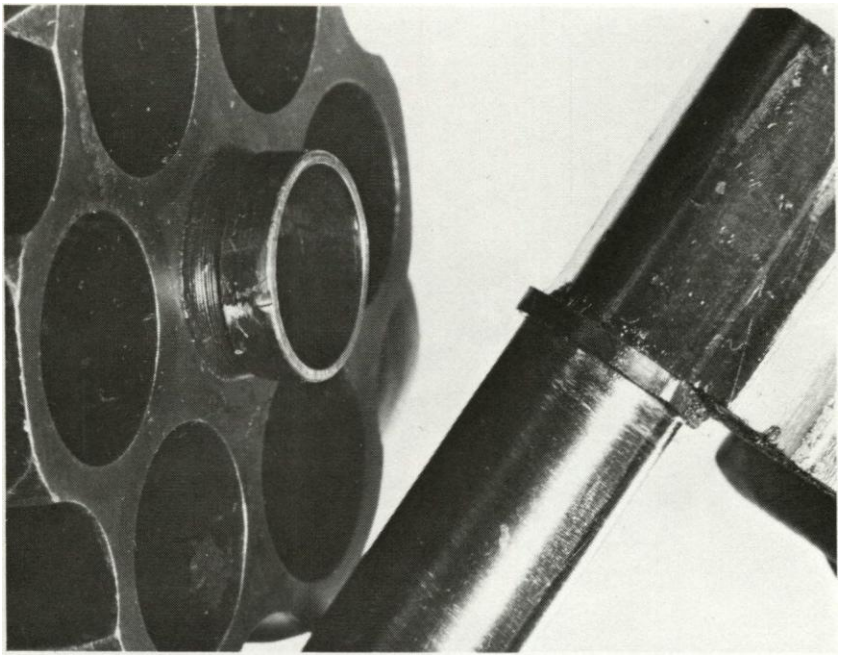
Building up the breech face is quite simple. After having determined the amount of excess headspace, cut close fitting shims of that thickness to fit into the breech-face counterbore. Tin the breech face and the shims, then press the shims in place with a tool made from strong drill rod and shaped like a two-tined fork, and heat until the solder flows freely. Maintain pressure on the shims until the solder solidifies. When cool, scrape away any excess solder and carefully clean up the area with needle files and stones, recutting extractor or ejector cuts and the like, then drill through the firing pin hole from the rear and polish it smoothly so the pin will not drag or bind.



A simple relief groove may be filed; it need not be threaded; loss of one thread poses no problems.

CORRECTION IN REVOLVERS

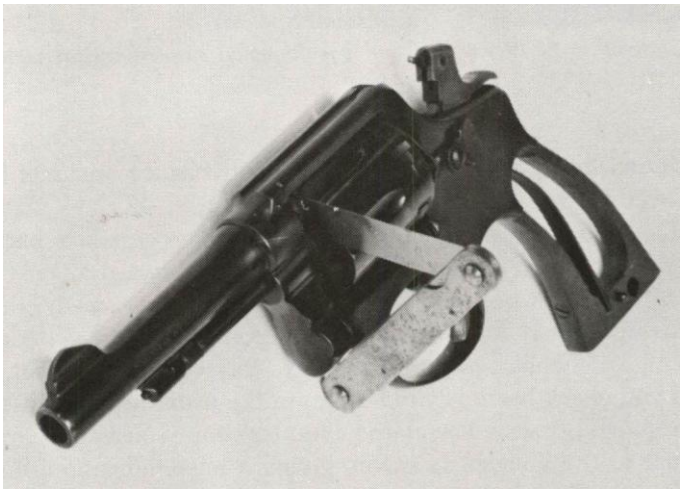
Seldom do shooters even recognize the existence of excess headspace in revolvers, much less do anything about it. In many instances, excess headspace is directly responsible for an excessive barrel/cylinder gap. Unless the cylinder's fore and aft position is fixed within the frame, the barrel/cylinder gap cannot be regulated properly. Normally, the position of the cylinder in relation to the recoil shield is regulated by an integral tenon or collar at the front of the cylinder, bearing against a matching surface on the crane. An exception to this is the SAA Colt with its separate cylinder-length base pin bushing which serves the same purpose. In single-action and other solid-frame revolvers, this surface bears on the frame; in typical, modern swing- out designs, it bears upon the crane. If this tenon or collar becomes worn, it will allow the cylinder to move forward towards the barrel. Continued firing thins this relatively small surface and sets the tenon back even further.



Close-up of S&W gas ring and equally small surface against which it bears on crane.

Each time a revolver is fired, the cartridge case sets back against the recoil shield, and this drives the cylinder forward against its head-spacing surface. Consequently, as that surface wears away, the barrel/ cylinder gap is reduced, even to the point that the cylinder begins rubbing on the barrel. Unfortunately, this condition is not detected when you check barrel/cylinder gap in the usual fashion. Inserting the feeler gauge between barrel and cylinder simply pushes the cylinder to the rear to the limit of its travel, giving a false indication of the gap's effective thickness. Thus correct headspace is necessary to establish the correct barrel/cylinder gap.

So before checking barrel/cylinder gap on a used gun, you must check headspace to obtain an accurate measurement. This is done by loading the chambers with fired cases, making certain that none of the primers protrude and that there are no burrs around the firing-pin hole, and then measuring the gap between the case heads and the recoil shield. This measurement should normally not exceed ·008 of an inch. Regardless of that measurement, keep the cylinder blocked fully forward. If you've a spare feeler gauge, simply keep those leaves in place, if not, shim stock or even a thin sliver of wood or cardboard will do the trick. All you need do is to hold the cylinder fully forward, solidly enough to obtain an accurate measurement up front. Now you can accurately measure the gun's barrel/cylinder gap.



(Top): Headspace is easily measured with a common feeler gauge inserted between the recoil shield and cartridges in the chambers. (Bottom): Barrel/cylinder gap is measured with a feeler gauge inserted between barrel and cylinder, but with the cylinder forward in its normal firing position.

To insure smooth, drag-free functioning, the barrel/cylinder gap must be at least ·005 of an inch when the cylinder is shoved forward. That's the condition existing at the time you start double-action pull for a second shot—the cylinder rammed forward by the firing of the last round, the case head still pressed against the recoil shield. If you do not intend to correct any excess headspace condition under these circumstances, then the gun can be restored to serviceability by simply opening up the barrel/cylinder gap to a minimum of ·005 of an inch. However, you'll be far better satisfied with your gun's performance if you do correct the excess headspace. To do this, you must either extend the headspacing surface forward on the cylinder or rearward on the crane or frame.

In Colt double-action guns, the front of the cylinder tenon is flat, and a thin steel washer, made of shim stock, can be sweated in place with soft solder and serve quite well. You can also use silver solder if you have a torch hot enough to do the job quickly without spreading the heat to the entire cylinder.

The thickness of this shim can be determined by checking the cylinder/barrel gap with an ·008-inch feeler gauge held between case heads and recoil shield, and again with the cylinder blocked fully forward. The shim thickness needed to obtain correct headspace is the difference between the gaps in those two conditions.

There is a more workmanlike (and more difficult and costly) method, of correcting headspace in Colt double-action revolvers, but it requires a lathe. The front of the cylinder around the axis hole is counterbored about 1/4 of an inch deep to accept a new tool steel bushing which may either be threaded or soldered in place, and then carefully faced off at the front to establish the correct headspace.

In Colt single-action revolvers (or their copies), the base-pin bushing controls headspace. It is a separate long bushing which may be removed from the cylinder and replaced with a new one whose front face is then stoned or filed down until the headspace is correct. Alternatively, a shim can be sweated to the front of this base-pin bushing, or the bushing's front lip may be peened to slightly greater length. I consider peening the least desirable of the two, since it reduces the thickness of the bushing's face and encourages it to wear more rapidly.

If you wish to do an extra-special job of correcting headspace on a single-action revolver, one that will last forever, then turn a new barrel bushing from tool steel and carefully harden its forward end.

Smith & Wesson double-action revolvers' headspace depends upon a short, integral tenon, known as a "gas ring", which extends forward from the center of the cylinder. The front face of this tenon bears on the crane and offers the only practical area where excessive headspace can be corrected. The simplest method is simply to peen this tenon, but you will obtain better results if you sweat a thin, steel washer onto the tenon's front face. Counterboring the front of the cylinder and installing a bushing of hardened tool steel in place of the gas ring is probably the best method of all.

Countless other methods of establishing headspace may be encountered in obsolete and foreign revolvers; however, some of the cheaper models do not even have any provisions for regulating headspace. Generally speaking, any gun worth spending time or money on will employ one of the foregoing headspacing methods or something similar to it, and one or some variation of the corrective measures discussed will allow you to regulate it to correct value.

CHAPTER 16 - Rebarreling a Revolver

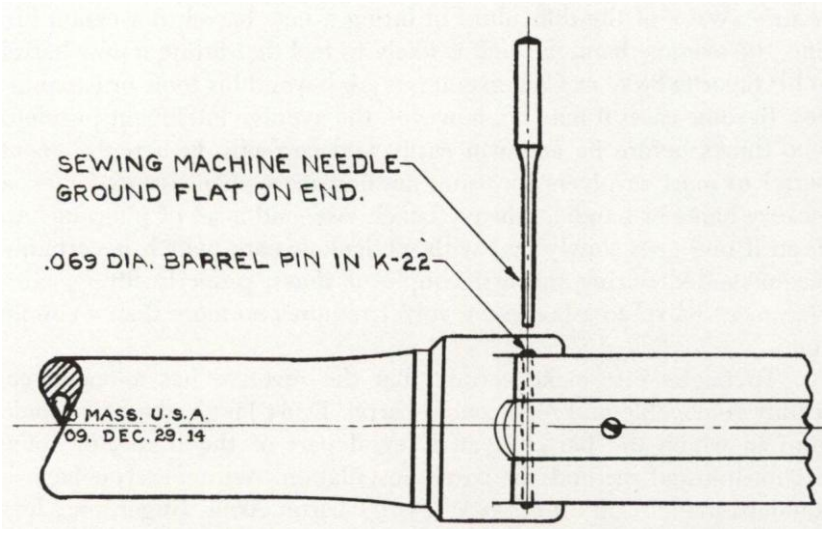
If he's aware of the difficulties of fitting a new barrel to a center-fire rifle, the average handgun buff is likely to feel that fitting a new barrel to his favorite S&W or Colt six gun is a job beyond his tools or capabilities. In some cases it may be, however, the average intelligent pistolero who thinks before he acts can easily and correctly fit a replacement barrel to most revolvers by using nothing more than assorted files, a hickory hammer handle, a heavy bench vise, and a set of pin punches. Even if one goes slowly and with meticulous care, which is certainly recommended during the first couple of times, properly fitting a replacement barrel to a favorite revolver requires no more than a couple hours.

To begin, first make certain that the revolver has a one-piece, readily removable and replaceable barrel. Don't laugh, there are some guns in which the barrel is an integral part of the frame, or some having unusual methods of barrel installation. Assuming you have a standard model Colt, Smith & Wesson, Charter Arms, Ruger, etc., first examine it closely and determine whether the barrel is pinned in the frame. Smith & Wesson regularly pins barrels to the frame, Colt seldom, and the others, sometimes.

REMOVING OLD BARREL

Strip the gun completely, removing every single part from the frame, and reinstall the side plate. Then with the barrel held securely in a padded vise, drive out the barrel retaining pin (if present) with a properly fitted punch. If the barrel pin is solid as in S&W guns, punch size isn't too important as long as it will enter the hole freely, but if the pin is of the roll type (hollow through the center), then you must have a punch with a dimple that fills the hole in order to push this pin's thin edges. If an undersized or tapered punch is used, it may simply jam itself into the hollow center of the pin, wedging the entire assembly tightly together. Carried to the extreme, driving a punch inside a pin like this may expand the hole to the point that an oversized pin must be used in subsequent reassembly.

Okay, assume the pin is out. At this point I normally remove the gun from the vise and smartly rap the receiver around the barrel seat several times (with a hard plastic hammer). Vibrations set up by these blows tend to loosen the barrel threads which may have gone untended for half a century and become tightly set. It is also helpful to dribble some Liquid Wrench or similar anti-seize material into the barrel/frame joint, let it set for five or ten minutes, and rap the frame a few times again. Then squirt on a little more Liquid Wrench. This allows the fluid to penetrate the barrel/frame connection completely and loosen it up for a quick and easy barrel removal.



Removal of S&W barrel pins require a good quality punch if damage is to be avoided. Shorten a heavy sewing machine needle as shown, then cup the end slightly with a fine, hand-grinder point so it will not slip off the end of the pin and mar the finish.

Now you need a set of blocks to hold the barrel tightly in the vise. With the S&W or other makes whose barrels are of irregular cross section, simply squeezing the barrel between two short lengths of soft 2 x 4s will indent the wood heavily, and then you can simply gouge out enough so that the blocks will fit tightly and hold the barrel securely. Be sure and carve wood away from the front sight so that if the barrel rotates slightly in the blocks, the sight blade will not be bent. You may not care about the sight on the barrel you're removing, but these same blocks will be used to install the new barrel, and you don't want to bend this sight!

This method will work on all S&W barrels with an underlug shrouding the ejector rod, all copies and similar barrel styles; in fact, on everything except perfectly round and unadorned barrels such as found on most single-action revolvers and Colts, except the Python and similar new models.

It's much more difficult to hold a round barrel immovable, so here use a set of hardwood blocks very carefully gouged and sanded out to fit the barrel contour tightly and fully so that there is only a 3/16 to a ¼-inch gap between the blocks when the barrel is seated. Then sprinkle powdered rosin in the grooves in the blocks and make certain there is no grease or oil on the barrel.

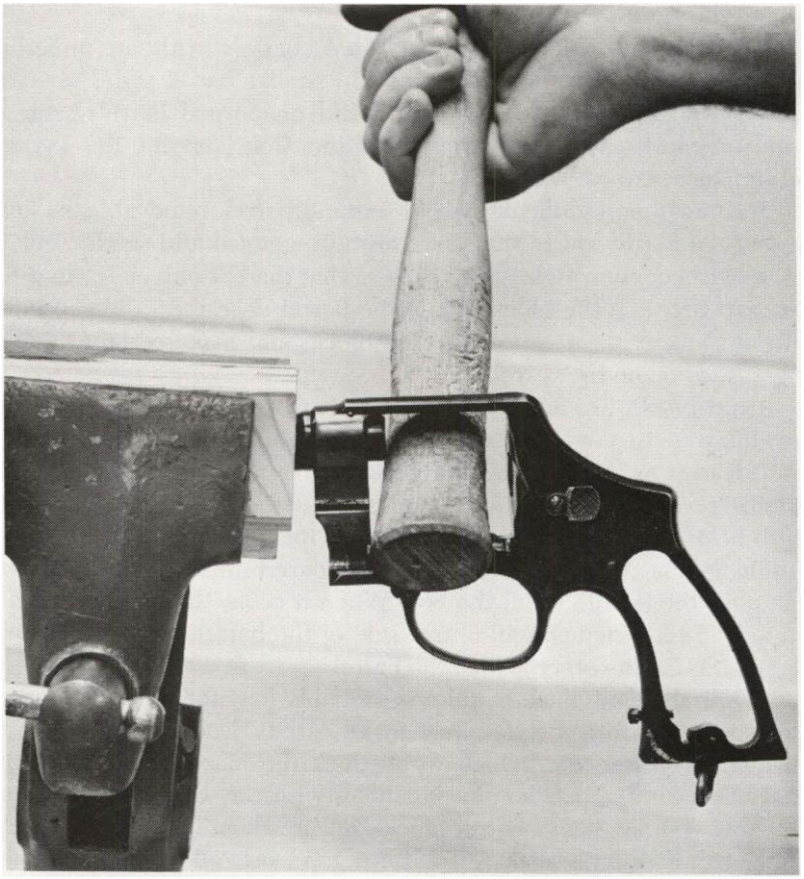
Lead blocks are an alternative to using wooden ones to hold the barrel in the vise, and they are just as quick and easy to make. While a pot of lead is melting, build up a wooden box notched at either end so that the revolver. barrel will be supported with approximately half its depth below the upper edge of the box. Wipe a thick coat of heavy oil or light grease over the barrel, hold it securely in those notches, and then pour the lead in to fill the box. When it cools, the result will be a heavy lead block which will fit one side of the barrel precisely. Repeat this process for the other side of the barrel.

While the lead block method is probably best for round barrels, it also works with other styles. Just make certain lead doesn't run into pin holes, recesses, etc. which would lock the barrel securely to the block. This can happen, so plug the holes with clay or similar material.

Now you have your barrel blocks. Secure them on the barrel with rubber bands or tape so that a uniform gap exists all around and then place the blocks in your vise, positioning them so the barrel is centered between the jaws. Tighten those vise jaws until your eyes bug out. It must be tight, tight, tight! If the barrel slips even the least little bit, its finish may be peeled off or it may become scratched. Worse than that, once it turns even the slightest in the blocks, you probably won't be able to finish the job without making a new and tighter-fitting set of blocks.

Here's where the hammer handle comes into play. Actually, a piece of oak Or hickory having rectangular cross section works better than a hammer handle, but trying to find it can be a chore, while hardwood handles are always available at the nearest hardware store.

Insert the handle in the cylinder opening of the frame and push or pull in the direction necessary to unscrew the frame from the barrel. Usually the amount of steady pressure you apply by hand will break the frame loose from the barrel and after that it turns off easily. However, in the case of an extra-tight barrel, take your heaviest hammer (assuming it's not over two pounds) and strike the end of the wood bar a single smart blow. Don't overdo it—use just a quick, sharp blow. This will break the frame/barrel junction loose, and then removal is easy.



With barrel clamped solidly between wood blocks in vise, the revolver frame may be turned off with a hardwood lever through the cylinder recess. A rectangular hardwood lever is best, but the ubiquitous, hickory hammer handle is handier and more readily available.

Don't pitch that used and worn out barrel you just removed into the trash can. It can be rebored to a larger caliber, relined to the same or another caliber, or serve some other useful purpose. In any event, it's worth something, so save it. Someday you'll probably want it, and if you threw it out . . . With the barrel removed, scrape away any old hardened powder and lead buildup inside the frame where the barrel protrudes to meet the cylinder. Be sure that gas cutting hasn't begun on the top strap, and then stone, scrape, or file away any burrs you find at either end of the threaded hole.

If the threads are dirty or rusty, the best way I know to get them clean is to chuck a brass bristle brush in an electric drill and spin it vigorously inside the threaded hole. Make sure the threads are as clean as possible. Also clean the front face of the frame where the new barrel will butt against it.

NEW BARREL INSTALLATION

As to the new barrel, wipe its threads clean, and then oil them lightly. If you're using a military surplus barrel, the threads may be heavily coated with hardened preservative, and a good solvent and a vigorous wire brushing may be necessary to remove all of it, but make certain you do remove it all. Turn the barrel into the frame as far as it will go by hand. If the barrel and frame threads match properly, you should be able to turn the barrel in all but the last turn or two by hand. If it's too tight to do this, carefully clamp your new barrel in the blocks and use the hammer handle to turn the frame on the barrel until their shoulders meet solidly, but don't try to put them together tightly at this point.

If turning the frame on the barrel seems to be taking too much effort, the barrel threads may be too large for the frame. If this is a severe condition, either the barrel threads or the frame must be "chased" on a lathe or cut down by using an adjustable tap and die set. This probably won't occur, but if it does, it is a precise job for a competent machinist or gunsmith, and not one you should attempt.

On the other hand, if the threads are just a little bit too tight, use a stiff steel-wire brush on a bench grinder motor and brush the barrel threads vigorously. Use quite a bit of pressure, and keep the barrel rotating, so that no one point is worked more by the brush than the rest. This brushing will usually clean and deburr the barrel threads so that they will enter the frame properly.

Now that the barrel and receiver are screwed together so that their shoulders meet solidly, take the rig out of the vise and look closely to see how much "draw" exists. "Draw" is the distance that the barrel must be turned past the point where it now is to bring it into proper alignment on the frame. Anything less than 1/16 of a turn may result in a too loose assembly, and anything more than 1/8 of a turn may require removal of metal on one or both shoulders.

At this time, also check very carefully around the complete perimeter of the junction to make sure that the two shoulders meet uniformly. A snug meeting on one side and a visible gap on the other indicates that at least one shoulder is not perfectly square. A gap of only a thousandth of an inch or so will close up as the barrel is brought into final alignment, but anything more requires that the barrel be removed and the high side of the frame shoulder be filed down. If this is necessary, use extreme care in doing it. It's far too easy to take off more metal than you intend.

Assuming that the two shoulders now meet uniformly, and that you have a 1/16 to 1/8-turn draw, look closely at the indicators you must use for alignment. Most revolvers do not have a "witness" or index mark on the frame and barrel to tell you when they are properly assembled. If your barrel has a rib on it, use that as an indicator; if not, you'll simply have to go by the front sight, eye-balling it until it appears to stand vertical to the frame.

So, put the barrel back in the blocks, place the blocks back in the vise, and again cinch it down as tightly as possible. Insert the hammer handle and turn the frame up on the barrel either as far as you can by hand, or until the alignment indicator tells you the job is finished. If you can't turn it quite all the way by hand, use the hammer to apply moderate raps on the end of the hammer handle until the frame is turned up to the proper point. Be extra cautious here, for it's easy to turn the frame past the proper alignment, and that means starting all over again.

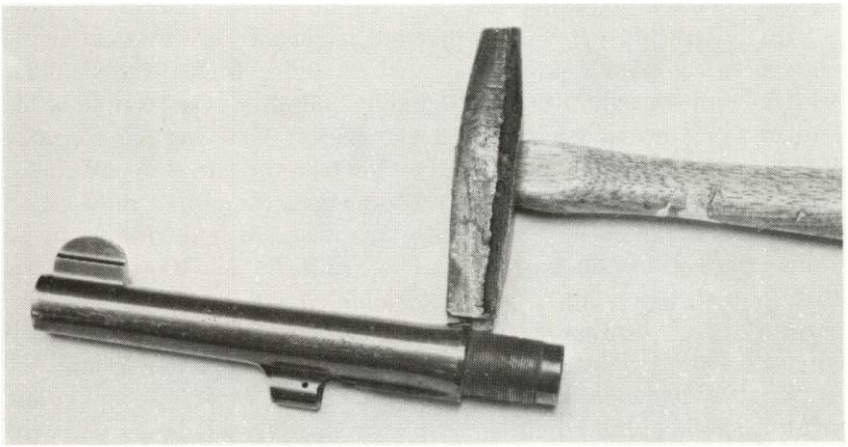
FINAL ALIGNMENT

If the frame moves up to the alignment indicator too easily and goes right past the proper point, there is work yet to be done. Or if you had less than the proper amount of draw, the barrel won't fit tightly enough to the frame. If only slight correction is needed, turn the barrel out of the frame, lay it on a lead or hardwood block so it's firmly supported, and use a light, small machinist's hammer with a smoothly polished face to peen the barrel shoulder.

Peening consists of tapping lightly around the circumference of the shoulder, at or very near its outer edge, overlapping the blows so that metal is moved rearward. If properly done, such peening moves the face of the shoulder rearward. Light blows overlapped about two- thirds of the striking area's width are necessary to prevent giving the shoulder a "hammered-on" appearance. But don't strike too heavily or space the blows too far apart.

Go around the shoulder this way once or twice and then try the barrel in the frame again. It's necessary to continue the peening process until a full 1/4-turn draw is obtained. The reason for this is that peening does not move the entire shoulder back. It moves only the outer edge, the amount decreasing toward the base of the shoulder. Consequently, additional draw is required to get a good "crush fit" of the narrowed barrel shoulder against the frame. Once you've obtained a 1/4-turn draw by peening, you can go ahead and complete the assembly.

If there is a gap obviously too large to correct by peening, there's no choice but to place a thin steel shim between the barrel and frame shoulders. Personally, I find that if the initial gap between barrel, shoulder and frame is more than ·005 of an inch (usually measured with a feeler gauge), it is easier to make a shim than to peen the barrel shoulder.



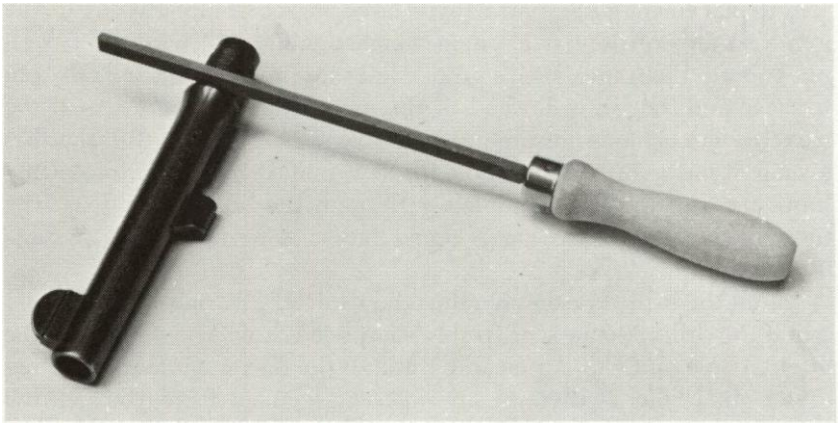
If barrel turns too far into frame for proper alignment and security, peen outer edge of shoulder lightly. Tack hammer shown here may not be the tool normally recommended for this job, but due to weight and balance, it works best for author.

Steel shim stock is sometimes difficult to obtain, however, brass is perfectly satisfactory and is much more readily available. Still, I prefer not to use brass because it cannot be blued to match the rest of the gun. Use shim stock about ·002 of an inch thicker than the measured thickness of the barrel/frame gap, and carefully trim the shim to size. Its inside diameter should be just enough to slip over the barrel threads, and its outside diameter should match that of the barrel shoulder. Once you have it carefully shaped and polished, heat-blue it, turn on the barrel, and bring it to final alignment.

But suppose that when you first turned the barrel up snug on the frame, it lacked more than 1/4 of a turn of coming to alignment. Metal must then be removed from one shoulder or the other so that the barrel comes within a 1/4-turn or less draw. Preferably metal should be removed from the rear face of the barrel shoulder, however, it is usually far simpler for the home craftsman to carefully file down the front of the frame where the barrel butts against it. The only real objection to removing metal from the frame instead of the barrel shoulder is that if it ever becomes necessary to again rebarrel the same frame, the new barrel may not have enough draw. From a practical viewpoint, I don't think this is worth worrying about, so I normally dress down the front of the frame until the barrel will turn up hand- tight to within a 1/4-turn draw.

In doing this, use a large flat file having a very fine cut, wide enough to completely cover the frame shoulder. Smoke the shoulder with a candle or lighter before beginning and after every couple of file strokes so as to make certain that you do not cut away more on one side than the other. File only lightly, then turn the barrel in and check. Repeat as necessary until the barrel turns in to the proper draw point.

If you'd rather do a more workmanlike job and remove metal from the rear of the barrel shoulder, start by masking the barrel threads with tape, and obtaining a small safe-edge file. Then, smoke the surface of the shoulder, and with the barrel held vertically in a vise, use short, overlapping file strokes to work completely around the barrel shoulder once. Resmoke the surface and repeat the operation. After a couple of times lightly around the shoulder try the barrel in the frame. If it goes, okay. If not, repeat until it does, but be extremely careful not to take too much metal off the barrel shoulder and likewise be extremely cautious to maintain squareness of the shoulder. It is very easy to let the file tip outward a bit and wind up with a shoulder that slopes somewhat forward. This won't do; the shoulder must be square.



If barrel fails to turn up far enough for proper alignment without excessive pressure, the shoulder contacting the frame face should be carefully filed back with a safe-edge file.

There is one more factor that might be involved in bringing the barrel and receiver to final register and alignment, even if you're working with the original barrel. Occasionally a barrel falls within a 1/4-turn, but it becomes quite difficult to "wring" into final alignment. Maybe the threads are too tight for that last portion of a turn, or maybe the shoulders of one or both parts are a little too hard, or there could be any number of reasons. If with normal and adequate pressure applied and the barrel still failing to seat fully, back off half a turn and run it up snug again. You'll note it has gone a little farther than it did before. Then, give it that last final shove or tap to bring it into alignment.

Whenever the barrel and frame are reluctant to wind all the way into position, backing off and starting again will normally advance them a small amount farther. Two or three such actions will eventually get them seated and properly aligned.

If your gun has a barrel-securing pin, such as with a S&W or other pinned gun, you must now replace that original pin. Solid pins usually remain serviceable and can be driven back into place. Roll pins should never be reused, nor, in my opinion, should they be used at all, so make a new pin of the proper diameter of hardened rod or wire. You probably have some broken twist drills in your scrap box, and they make most excellent pins when cut to the proper length and their ends rounded and polished.

Replacement S&W barrels will have a groove already cut in the upper surface of the barrel tenon which should align with the barrel-pin holes in the frame. If this groove lines up properly, just tap the pin in place and the job is finished. If the groove doesn't line up, or if the barrel you're using is not pre-grooved, select a high-speed drill that has a snug fit in the original pin hole in the frame. Using plenty of cutting lubricant, run the drill completely through the hole, cutting its way through the edge of the barrel tenon and opening up a clean passage for the pin.

Run the drill very slowly (thus the value of a variable-speed drill) and if the drill bit is new or freshly sharpened, it will be guided by the original hole and will cut cleanly through the barrel without enlarging the original hole. If there is any hole enlargement (and you can tell this by trying the original pin in it) select a very slightly larger drill (usually the next larger number drill is right) and run it through the hole to clean it up. If you happen to have some small, straight pin-reamers at hand, select one of them that will just clean up the hole and turn it through by hand. In any event, if there has been any hole enlargement, you'll have to make a slightly larger pin. Again, broken drill shanks work beautifully, but if you've gathered about you a few bits and pieces of small-size drill rod, annealed spring stock, etc, you'll have no trouble making a new pin to fit properly. Regardless of whether a new pin, an oversized pin, or the original is used, the pin should be a drive fit. If it isn't, it's too small, so make one slightly larger.

ADJUSTING BARREL-CYLINDER GAP

The final operation in fitting a replacement barrel to a revolver consists of adjusting the barrel/cylinder gap so that it is wide enough to insure proper cylinder rotation, even when the gun is hot and dirty, and yet not so wide that excess gas will be lost through it, thus reducing ammunition performance. While some like to set up this gap as narrow as ·003 of an inch, I have found that under conditions of rapid fire and accumulated fouling, such gap is too small. It will allow the front face of the cylinder to drag on the rear face of the barrel and interferes with proper cylinder rotation.

The best compromise is a gap of ·006 of an inch—certainly not less than ·005, nor more than ·008 of an inch. You should have in your basic equipment a simple feeler gauge of the type, widely sold for checking spark plug gaps. It will be your measuring tool.

Without installing the lockwork of the gun, assemble the cylinder along with all its components (ratchet, ejector rod, etc.) on the crane and place the crane in the gun. Put empty cartridge cases in the chambers, and after you've made certain that there are no burrs protruding around the firing pin hole in the recoil shield, glue a piece of ·003-inch shim stock over the firing-pin hole with heavy grease. Put a dab of grease on the recoil shield, lay the flat piece of shim stock over it, and press hard so the excess grease is squeezed out and the shim remains stuck in place.

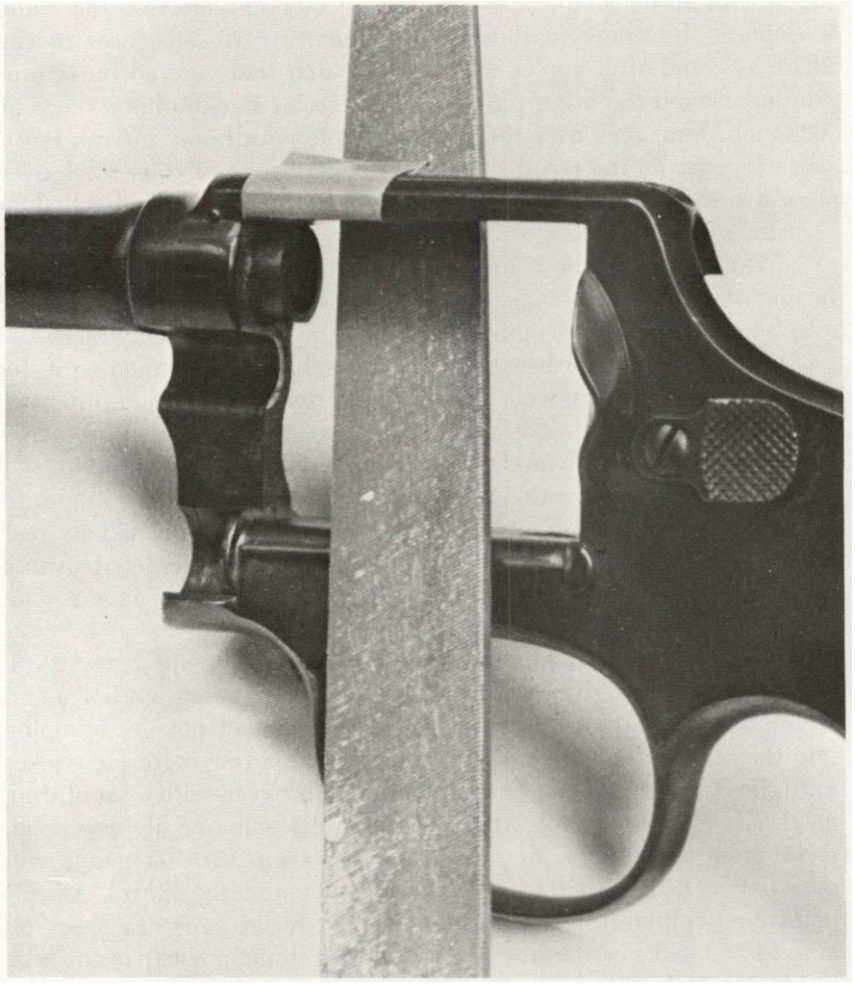
While pressing the cylinder rearward so that the cartridge case-heads rub on the shim stock, attempt to close the cylinder. Normally, it will bump into excess length of barrel at the rear. Carefully mark the barrel with a scribe flush with the front of the cylinder, then with the cylinder and crane removed, set the gun upright in the vise, gripping it by the barrel. Wrap masking tape around the top strap and any other part of the frame which might be accidentally scraped with the file.

Taking extreme caution to keep the file flat and at right angles to the barrel in all planes, file the barrel down squarely across its rear until shortened to the mark scribed flush with the cylinder. I cannot overemphasize the necessity for keeping this rear barrel face square and at right angles to the barrel axis.

This done, reassemble the crane and cylinder to the frame (still using empty cartridge cases and the shim over the firing-pin hole) and attempt to close the cylinder. It probably still will not go, bumping into the rear of the barrel. Very carefully take a few more file strokes until the cylinder will just barely close, perhaps even with a bit of drag on the rear of the barrel. Now very carefully stone or file additional metal from the rear of the barrel until a ·005-inch feeler gauge will pass between the front face of the cylinder and the barrel. At this point use slightly greater thicknesses of the feeler gauge to check all around and make certain the gap isn't wider at one point than the rest; if it is, carefully true up the rear of the barrel until the gap is uniform at all points.

Remove the cylinder and, using a scraper or round Arkansas stone, remove any burrs that the filing has turned up inside the forcing cone. Reassemble the gun fully, remove the shim on the recoil shield, and dry fire it at least 40 or 50 times with fired cases in the chambers. Make sure there is no drag of cylinder on barrel. Use smoke or lipstick on the barrel and cylinder to make certain there isn't any imperceptible contact.

Then fire at least 30 full-charge rounds through the gun just as rapidly as possible (double-action) and note whether cylinder rotation becomes any more difficult as the gun heats and fouls up. If it does, look for scrape marks on the barrel and cylinder face. If the cylinder is dragging on the barrel when firing full-charge rounds, it may be that headspace is a bit excessive and the cylinder is thus being pushed forward by the hand to rub on the barrel.



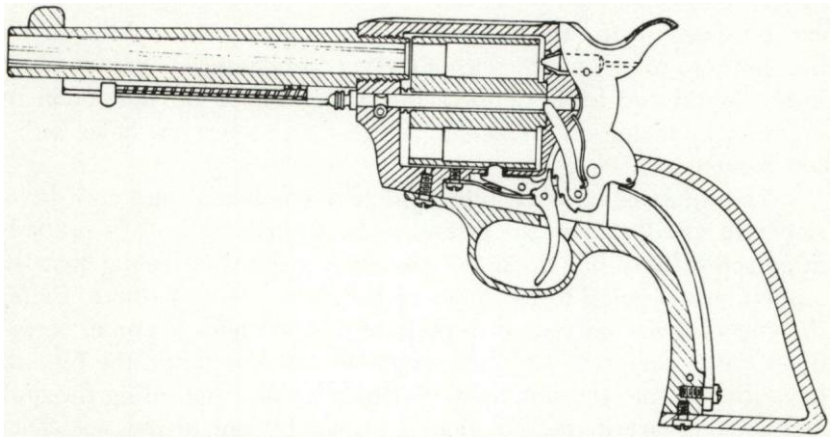
When barrel/cylinder gap is too narrow, mask topstrap with tape as shown and very carefully dress off the rear barrel face with a smooth-cut flat file.

To check for this, with the gun thoroughly cleaned, close the cylinder with fired cartridge cases in place and slip as many leaves of a feeler gauge as possible between the case head aligned with the barrel and the recoil shield. The gap should not be more than ·008-inch although if it is a little greater, no great harm will be done. With the cylinder then wedged as far forward as it will go, again check the clearance between the cylinder and barrel. If the gap is too narrow, do some more filing until it will admit a ·005-inch feeler gauge. This will insure free and easy functioning, even though headspace is excessive. Headspace is controlled by different methods in different guns, and its correction was covered in the preceding chapter.

CHAPTER 17 - Repairing the Colt Single-Action Army Revolver

Somewhat over one-third of a million Colt SAA revolvers were manufactured from 1873 until 1941, and the majority of them were purchased as working guns which saw rough service on frontiers all over the world. In addition, many thousands of near identical guns have been produced by Colt since WW II, and countless thousands of copies and near copies have been manufactured all over the world.

Though many of the original Colts have found their way into collections and are thus removed from circulation, many thousands remain in use and repairs are often necessary. It has often been said that the SAA design is one that will always work, even if one or several parts are broken, but it has an unearned reputation for reliability. In truth, there are a number of weak points in this 1836-vintage design with the result that the old Colt thumb buster in regular use is far more likely to require repairs than a modern DA gun. Fortunately, repairs to the Frontier Model are relatively simple, aside from the rebuilding job on the trigger nose and hammer notches, and well within the capabilities of the home gunsmith and hand tools.



This left-hand section view of the SA Colt shows the relationship of all working parts with the hammer at rest in the fired position. (See also exploded view, Appendix I.)

REMOVING STUCK SCREWS

Probably the first problem encountered when someone resurrects grandpappy's SA Colt and wants it repaired so he can shoot it is its disassembly. Old guns that have been left laying around for years without any attention, may have their screws (five holding the back- strap and trigger guard alone) rusted in place and have their heads badly chewed up. To compound this situation, the four main screws holding the backstrap and trigger guard to the frame are deeply countersunk and cannot be reached with a slitting file or hand grinder so as to recut their driver slots and facilitate their removal.

The exposed screw heads can have their slots recut and deepened with a cutoff wheel which has been reduced to bare minimum diameter and chucked in a Moto-Tool. With the gun clamped in a vise and your wrist on a solid rest so you can control the grinder precisely, the tiny cutoff wheel will eat right down into the screwhead, deepening and truing up the original slot so that you can get a screwdriver bit properly engaged. Sometimes the vibration and heat of re-cutting the slots will loosen the screw somewhat in the frame so that it may be turned out easily. Assuming, though, that it does not, you should next soak the screw thoroughly with one of the penetrating anti-seize compounds sold, such as Liquid Wrench or similar. While it seems simple to merely squirt the liquid around the screw hole and other entrances and let it soak in, I've found that by also rapping smartly and rapidly on the frame around the hole with a light, brass hammer, the action can be speeded up. These liquids all evaporate very rapidly, so the best bet is to submerge the part of the gun containing the frozen screw in the liquid and let it sit for a few hours. Speed up the action by occasionally taking the frame out, rapping over the screw holes with a soft hammer.

The combination of tapping, anti-seize compound, and new driver slots will usually allow the screws to be turned out with a properly fitted screwdriver bit. If, in the process, you get the feeling that the screwdriver is going to jump out of the slot, quit right there. Clamp the gun in a vise on your drill press table and chuck a proper screwdriver bit in the press. Carefully align the screwhead and the bit, and lower the bit into the slot, holding it there solidly, and using the quill lock nuts, secure it there so that it cannot lift out of the slot. Then rotate the drill chuck by hand (using a wrench or by pulling on the press belts by hand) and the screw will either loosen or its head will split. Once the screw has been loosened in this fashion, unlock the press quill so it can move as the screw backs out of the hole.

If the screwhead splits, you are left with only one alternative, that of drilling the screw and twisting it out with a screw extractor, commonly known as an E-Z Out. If you're not familiar with this little gadget, it is simply a tapered piece of very tough and hard metal containing very fast-pitch, left-hand threads. It is used by drilling a hole centrally in the shank of the screw to be removed, then tapping the E-Z Out into the hole and rotating it counterclockwise. Its own reversed threads will bite into the inside of the screw and twist it out.

In detail, here's how it's used. With a sharply-pointed center punch, very carefully dimple the screwhead in its exact center. Make this dimple deep enough so that a clean, freshly sharpened, high-speed drill bit can get a bite. Then carefully drill about 2/3 of the length of the screw shank with a bit approximately 2/3 the diameter of the screw. This job is best controlled in a drill press, but it can be done with a portable hand or electric drill if one is very careful and uses a low drill speed.

The last step; gently tap the appropriate E-Z Out into place and rotate it counterclockwise with a tap wrench or other close-fitting wrench that offers plenty of leverage. If by chance the E-Z-Out doesn't pull out the entire screw shank, but merely pulls out chunks and leaves part of it in the hole, you can finish the job by redrilling and retapping the hole.

The deeply-countersunk pair of screws holding the backstrap and trigger guard to the frame are another matter. Their slots cannot be cut as the others. File away any burrs that are partially blocking the counterbores in which the screws are buried, and then use plenty of anti-seize compound and tapping to try to free the screws. Then, with a screwdriver of the type made by Bonanza that will fit closely in the counterbore, feel out the driver slot. If the bit enters the slot and obtains reasonably good purchase, set up the gun and bit in the drill press and attempt to remove the screw as already described. If the bit cannot obtain good purchase, use a short section of screwdriver bit like a punch. Align the bit in what's left of the original screw slot and then tap it sharply with a hammer, driving the bit into the original slot. You may then be able to twist the screw out.

When nothing else seems to work, heat application around the screw hole will sometimes break one loose. Don't overheat the frame or you may spoil the finish (if any) or heat treatment. Simply apply heat lightly while tapping on the screwhead and attempting to twist it out. When all else fails, you'll simply have to drill out the screws as described above. It will sometimes make the job easier if you drill out the screw head completely, using a drill of the same diameter as the counterbore, and then merely pull the straps off the frame. This will leave a short section of the original screw protruding from the frame, which can be drilled out afterwards.

Another last resort is to carefully center punch and drill tap-sized holes for replacement screws and re-thread them. You can then use replacement screws without any difficulty. Some of the original threads may be lost in this process in the event the tap does not follow them, but there should be plenty left for good, tight assembly of the gun when you're finished.

DISASSEMBLING AND CLEANING

Assuming you've gotten those stubborn trigger guard and back- strap screws out, the rest of the job is easy. If bolt, trigger and hammer pivot screws are frozen, they can be removed in the same way by first recutting their slots and turning them out in a drill press. Generally, though, they don't become as tightly frozen as the others. Of course, if the ejector housing screw is also frozen, it can be given the same treatment as was given the countersunk strap screws, but extreme care must be taken not to drill through into the bore.

Once you've separated every part out of the gun, each should be made scrupulously clean. Old guns will have all manner of hardened grease, dirt, sand, weed seeds, powder residue, and any other imaginable material packed tightly into their recesses. Most of this can be removed with soft scrapers and dug out of holes and recesses with pieces of wire and shaped sticks. Even so, you won't be able to get the inside of the frame completely clean, so what I generally do is toss it into a pot of water and detergent and bring the whole thing to a boil for a few minutes. A hard, rolling boil will loosen up lots of extra crud and the detergent will dissolve old grease and float out much of the remaining material. Rinse off and let air-dry, and if there's still rust and scale inside the recesses of the frame, take a small wood or plastic paddle and cram the inside full of Naval jelly, then let it sit for a spell. Go ahead and scrub all the other parts thoroughly in solvent with an old toothbrush while the jelly is acting, then finish up by sluicing away its residue with solvent.

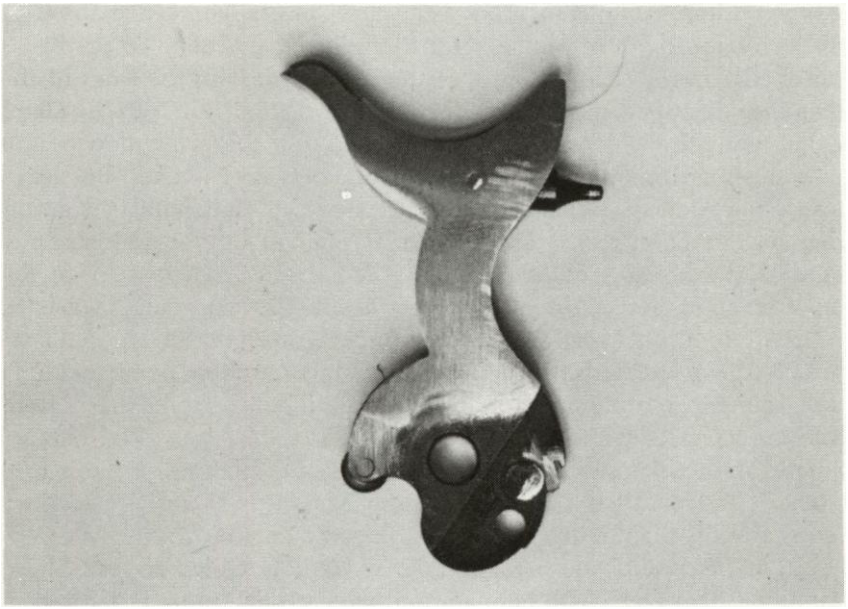
If you've wondered why I made no mention of checking for defects before disassembling the gun, it is simply because many old guns malfunction only from the dirt and rust in their innards. Now that we have all the parts cleaned, we can check to see what's wrong and requires repair or replacement. If there are no obvious defects, broken springs, chipped out hammer notches, broken parts, etc., then it's time to reassemble the gun with the clean parts and check its functioning.

TYPICAL REPAIR WORK

One of the things most likely to be found is that the safety notch is chipped out slightly and will not remain engaged when pressure is put on the trigger or hammer. The same problem is also often encountered with the half-cock or loading notch, and to a lesser degree with the full-cock notch. Usually you'll find that in conjunction with chipped notches the trigger nose is also chipped. So, if functioning isn't correct in all three notches, take the trigger and hammer back out and examine those surfaces closely. Compare them with the sectional view and if they don't match up, you must either obtain new parts or build up and reshape the originals.

New parts represent the simplest, quickest, and usually the cheapest—not to mention the most satisfactory from a functional viewpoint—method of correcting hammer and trigger deficiencies. However, even though replacement parts are readily available, many people insist on retaining the originals because of sentimental value or whatever historic interest the gun has to them. If the gun is in the hands of a collector, he will almost invariably insist upon repairing or restoring rather than replacing parts.

Installing new parts consists of nothing more than carefully stoning the engaging surface of the trigger nose and full-cock notch so that uniform bearing is obtained and the surfaces are glass smooth. Don't lean the notch or trigger nose either way for the reasons stated. If the new hammer and trigger wobble on their screws, replace the screws as well. If the inside of the frame is so worn that the parts have significant lateral play, Teflon sheet or steel-shim washers installed as described in the chapter on double-action tuning will cure the problem.



Note middle or safety notch is chipped out on this SA hammer.

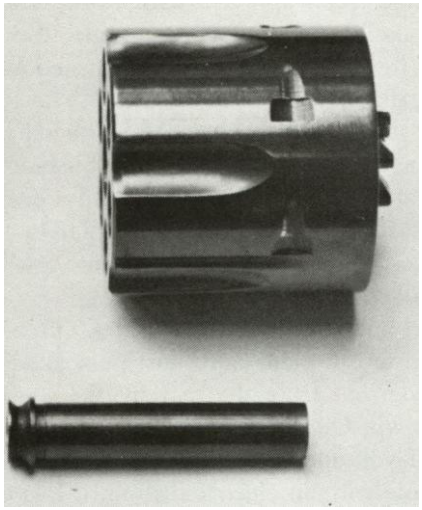
Rebuilding the original hammer and trigger require first-class welding, so if you can't do it, find someone who can. Build up the trigger nose about 1/8 of an inch, taking care not to burn through the remaining portion of the nose at its junction with the weld. No great amount of metal is required since seldom is more than 1/16 of an inch of vertical build-up necessary. Once the weld is cool, carefully file to original shape (and a new trigger is the best guide to this, for you can pin and clamp them together and shape the weld to match the new one precisely) and polish smooth so that no deep scratches or gouges remain to act as stress raisers and cause eventual failure.

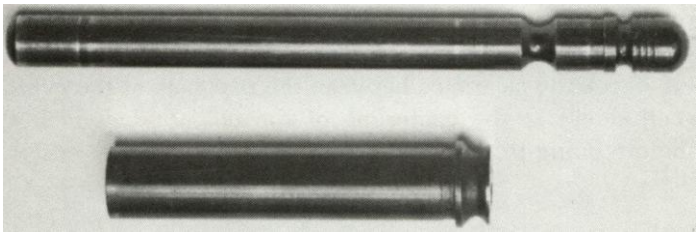
The hammer is a similar but more difficult job, and a new or serviceable hammer is almost essential as a guide for reshaping the welded portion. Have the weld built up from below the original safety notch position completely around the curve of the hammer to about 1/8 to 1/4 of an inch above the original full-cock position. Once this is finished, carefully file the sides of the weld flush with the sides of the hammer and then pin and clamp the new hammer in careful alignment with the old one. Now, grind and file the weld down until it is flush with the new hammer's contour between notches, but leave excess metal at each notch location for more careful shaping. I find it best at this point to use a very slender pointed scriber and carefully outline the notch profiles on the welded surface. Then, remove the new hammer, and with your smallest needle files and cutoff wheel in your Moto-Tool, bring the notches and the balance of the hammer profile down precisely to the scribed outlines. At this point take fine abrasive paper or cloth and shaped sticks and polish all file marks from the outer surfaces of the welded-up portion, but leave the notches alone. With Arkansas stones and Brownell's flexible files of finest grit, smooth and polish the notches, removing as little metal as necessary and carefully maintaining the proper angles.

At this point, you had best have what is called a sear block, simply a steel plate with hammer and trigger pins properly located in it. Place the trigger and hammer on their respective pins on the block and carefully match the trigger nose to the notches and vice versa. If necessary, thin the trigger nose or widen the safety and half-cock notches until it will enter them to their full depth. In doing this, do not reduce the thickness of the trigger nose to less than 1/32 of an inch. Once this is done, match the trigger nose and full-cock notch carefully by stoning and bring the notch down to its final depth of about 1/32 of an inch.

At this point you are ready for hardening the welded areas, which should be accomplished in accordance with our instructions elsewhere. Do not under any circumstances attempt to assemble the unhardened parts in the gun and snap it a few times to make sure everything works. If you've fitted the two parts together properly on the sear block, they will work in the gun, and if you try them unhardened, you'll simply undo all the work you just finished. The notches and trigger nose must not be placed under normal functioning loads until they are properly hardened.

You'll probably also find that there is a fair amount of fore and aft play in the cylinder. This is due to wear on the front face of the cylinder bushing. This is a separate tubular part, fitting inside the cylinder with its front end enlarged to bear against the rear face of the front upright of the frame. It may also be due to some peening or wear at that point in the frame. Before trying to correct this condition, check to make certain there is no up and down and/or side to side play of the cylinder on the base pin. If there is, check the base pin carefully for excessive wear, and if it exists, obtain a replacement. If replacement isn't possible or is not acceptable, the original can be metallized or plated to bring it oversize, then turned and polished back down to the proper diameter.





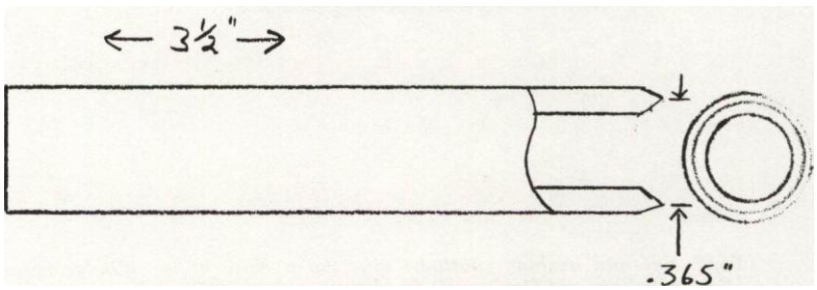
(Top): Base-pin bushing (bottom) must be a close fit in cylinder to avoid play. (Bottom): Base pin (top) must fit closely in bushing and in frame in order to hold cylinder securely.

Assuming that the base pin is o. k. or has been replaced, look at the area of the frame engaged by the cylinder bushing and if there are burrs or peening, carefully file them away until a smooth, flat surface is produced. This surface must be perpendicular to the centerline of the bore in both axes. If it is finished off at an angle, both it and the cylinder bushing will wear much more rapidly.

Remove the old bushing from the cylinder. Often this part will be found jammed or rusted in place and must be soaked in the anti-seize compound and driven out from the rear by the specially-made, two- diameter punch shown. Once the bushing is out, carefully clean the hole with solvent. If you find scale and rust inside, spin a brass-bristle bore brush in the hole with an electric drill until it is clean and bright. It must be clean to accept a new bushing properly.

Obtain a replacement bushing from Colt's, insert it in the cylinder (applying a thin coat of good grease to both parts to prevent future rusting and seizing) and attempt to place the assembly in the frame and insert the base pin. Usually the unit will enter the frame okay, but occasionally the front end of the bushing won't clear the area of the frame it contacts up front. In that case, very carefully dress down the end with a file, taking care to keep it at right angles to the bushing centerline, until it will just barely fit.

Next, with feeler gauges or a special gauge you might make up yourself, check the clearance between the rear face of the cylinder and the recoil shield at the centerline of the chamber aligned with the bore. Before doing this, make certain there are no burrs raised around the firing-pin hole and that the firing-pin bushing is flush with the recoil shield. Distance between the recoil shield and the cylinder should be ·060″ at this point. Generally, when a new cylinder bushing has been just installed, it will be somewhat less. So, checking frequently with the gauge, dress the front face of the bushing down until—when the cylinder is held solidly forward—a full ·060″ exists between the cylinder and the recoil shield.

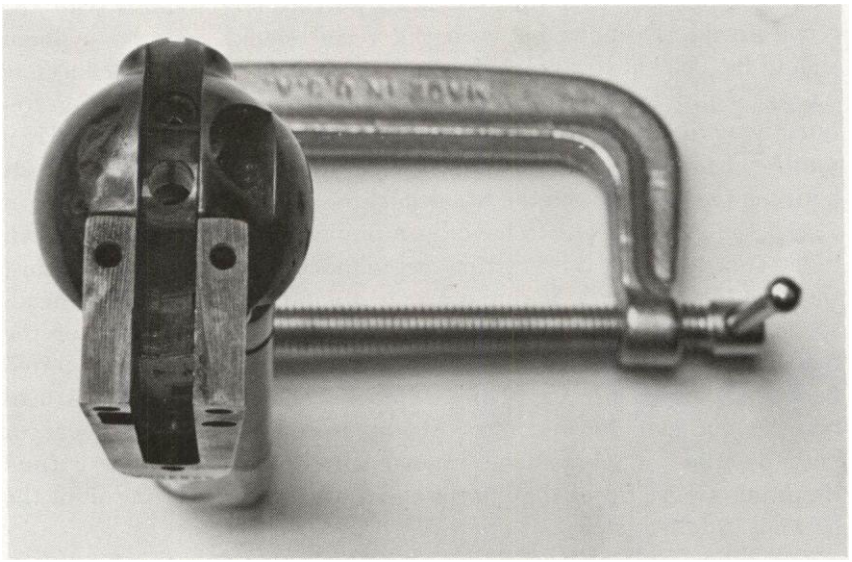


Shop-made staking punch for crimping SA Colt firing-pin bushing.

If the gun happens to have been improperly rebarrelled or re-cylindered in the past, the front of the cylinder may be binding against the rear of the barrel. If this prevents obtaining the full ·060″ headspace, and if the original barrel is to be retained, carefully dress off the rear of the barrel breech until a ·005″ feeler gauge may be inserted between it and the frame of the cylinder when a ·060″ gauge is held between the cylinder and recoil shield. If you intend to replace (or perhaps reline or rebore) the original barrel, simply unscrew it from the frame to get rid of the interference and save final fitting until the barrel is installed later.

Another fault may exist in the original cylinder; the front face may not be strictly true and perpendicular to its centerline. In checking barrel/cylinder gap, you'll discover this if the gap varies in thickness as the cylinder is rotated. So, when you've got the gap regulated so that a ·005″ feeler fits snugly, rotate the cylinder one complete revolution and note whether the gap varies. If it varies more than ·005″, you'll be doing the gun a favor by having a sharp lathe operator very carefully true up the front face without reducing its overall length. If a lathe isn't available, this job can be done by very careful file work if the cylinder face is smoked and then rotated over successively thicker feeler gauges to indicate the high spots, and then by carefully filing those high spots down.

Another defect due to wear may be noted in the original base pin and to a lesser degree in the frame itself. The rear end of the pin and the front portion that rides in the frame may be worn undersize. If the wear is only on the pin, then replacing or building it up will solve the problem. However, if the holes in the frame are also worn oversize, even a new or rebuilt pin won't be as snug fitting as it should. Frame wear can be corrected by reaming out the original holes and carefully pressing tool-steel bushings in place and then reaming them to a slip fit on the base pin. Alternatively, you can make a new oversize base pin or build up the original to oversize to fit the worn frame hole precisely. This will then require in most instances that the cylinder bushing be reamed or polished to match the larger diameter pin.



If base-pin hole in frame is oversize, cylinder will wobble. Can be corrected with oversize base pin, or by drilling out hole and fitting in a bushing.

Naturally, the base pin must be properly retained in the frame. The late model spring catch for this purpose is available as a replacement part, and on guns originally fitted with it, installation of a new unit is quite simple and the procedure readily evident. If the new catch is abnormally loose because the original hole is badly worn, the condition can be corrected in two ways. If you're not a welder, the simplest way is to open up the hole and press or solder in a thin-walled bushing reamed to a close fit on the replacement catch. This bushing is then carefully filed down flush with the sides of the frame and is cut away with a needle file or reamer inside the base pin hole to allow the pin to pass. A less visible repair (if the frame is to be refinished) is to simply weld up the original hole and re-drill and ream it to a proper fit for the new catch.

The old-style base pin retainers—simply a set screw—are usually battered and often the threads in their holes in the frames are stripped or badly deformed. The only worthwhile fix for this is to weld up the hole and re-drill and re-tap and then install a new set screw.

It may be that you want to modernize the gun and fit the later spring-plunger base pin catch. This isn't particularly difficult to accomplish if you are a careful drill press operator. Simply anneal this portion of the frame and then very carefully mark the hole location, transferring it from a late model frame. Then, with a new catch as a guide, drill and ream the holes from opposite sides and install the catch. Of course, to do this properly requires welding up the original set screw hole.

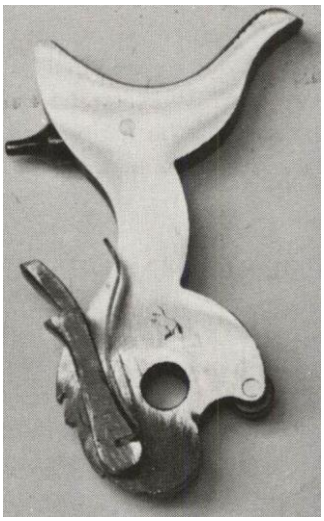
If the original barrel is to be retained, one could proceed at this point to fitting up the rest of the action and replacing or repairing parts. If not, there's the barrel replacement job.

BARREL REPLACEMENT AND ADJUSTING TIMING

Replacing a SAA barrel is identical with replacing a DA barrel as outlined in the chapter on rebarreling. This holds true whether you are using a good original barrel, a modern replacement, or an original relined or rebored barrel. Simply follow the instructions given in that chapter, but do not open up the barrel/cylinder gap to the full ·006″ suggested there until squareness of the front face of the cylinder and barrel breech has been verified. The ·005″ barrel/cylinder gap mentioned was advised only to allow a bit of additional fitting as other operations continue. Now, with the barrel installed, the hammer and trigger in first-class order, and the cylinder and base pin properly fitted to the frame, we can proceed with timing.

First of all, you'll need the range rod mentioned elsewhere in this volume for checking the cylinder/barrel alignment. Unless the original bolt and hand are obviously ruined, assemble them in the gun and check the gun for normal functioning. If the cylinder does not rotate to the point where the bolt will snap into position at the time the trigger nose snaps into the full-cock notch, the hand is either too short or has become excessively worn at its nose. If a replacement is acceptable, install a new hand and recheck. If the original must be used, build up its nose about y1/16″ by welding and then carefully file it to shape using a new hand as a guide, leaving it just a few thousandths of an inch long.

Smoke the nose of the new or built-up hand and install it in the gun, cock the hammer once, and then remove and observe the bright spots which show where you must reduce length. Carefully file and stone the hand down in this fashion until it rotates the cylinder fully into position by the time the trigger nose snaps into the full-cock notch. The nose of the hand should then be polished smooth and rehardened, though an unhardened hand will give good service for several hundred rounds. When rehardening, don't forget to remove the hand spring or the heat will ruin it.



Hand attaches to hammer on left with slender pin. Spring must be securely attached, hand firm but movable on hammer. If hand is too thin for its slot in frame, timing won't be good.

At this point, determine whether the hammer has excessive overtravel after the cylinder is rotated and the trigger nose has passed the full-cock notch. If too much overtravel exists, one will automatically and unavoidably pull the hammer completely through it when cocking in a hurry—and the cylinder will be caught by the bolt before the end of this overtravel is reached, with the hand being jammed tightly into the ratchet, creating excessive wear on both, and occasionally even breaking off the hand pin.

Excessive overtravel is eliminated by welding or silver-soldering metal to the rear of the hammer and then dressing it down until it contacts the back strap and halts the hammer just barely past the full- cock position. Alternatively, additional metal may be soldered or brazed in place on the back strap to contact the original hammer contour and serve the same purpose.

Now we come to what I consider the most trying job on the single-action Colt. Fitting the bolt and final timing. With the gun cocked, check the cylinder for radial play. If the gun has seen any service at all, you'll probably find a good bit of looseness here, brought about by wear on the sides of the bolt and also on the sides of the locking notches. You can't help the notches much except by buying a new cylinder, so all of the work must be done on the bolt and, sometimes, on the frame. As with other parts, it's best to begin with a new Colt replacement bolt, but if this isn't acceptable, carefully weld up the sides of the original bolt and then dress them down parallel to the point where the widened front end of the bolt will just barely pass through its square hole in the frame. If there is evidence that the bolt has not been entering the locking notches deep enough, you may also build up the top of it a bit.

Dress both sides of the built-up area down parallel to the point where the bolt will just barely enter the bolt hole in the bottom of the frame. Then, take the bolt out and manually check it in all of the locking cuts in the cylinder to determine if it will fit. If it does with a minimum of clearance, you're still okay. However, if it enters all the cuts with an excessive amount of lateral play, go back and build up the sides until, when dressed down, the bolt will just barely enter all the cuts. Now, go back to the bolt hole in the frame and remove equal amounts of metal with needle files from either side of it until the built- up bolt will just barely pass through.

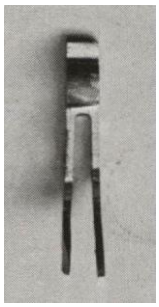
Assemble the gun and cock it on each chamber and check each with the range rod to determine whether or not the cylinder is being properly aligned. It may be, but chances are that it will lock up just a wee bit either side of proper alignment with the bore. Let's say that it rotates just a few thousandths of an inch past the proper position. We can correct this by moving the bolt to the right slightly more than the amount of misalignment.

To do this remove the trigger guard and bolt, and slip the bolt- carrying portion of the frame over a solid steel bar supported solidly in a vise. Then, take a smooth-face punch and hammer and lightly peen the left or inner edge of the bolt hole, thus moving it to the right. Use vernier calipers to determine the amount of movement, then file a corresponding amount from the opposite side of the hole so that the bolt will still enter. Don't overdo this at first, just move the bolt five to ten thousandths of an inch, then reassemble the gun and recheck all chambers. Repeat this if necessary until at least half of the chambers align sufficiently to accept the range rod. The odds are that you won't be able to align all six chambers perfectly, simply because the chambers themselves are probably not perfectly spaced in the cylinder. If you can obtain proper alignment of at least half of the chambers, you're in good shape.

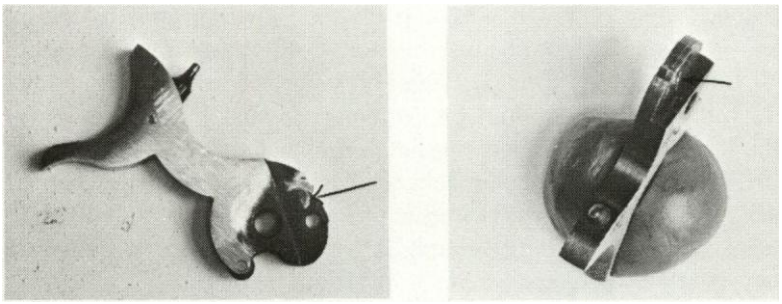
We now have the cylinder locking up properly and in proper alignment, but we're still not finished with work on the bolt. Now, maybe you understand why I said I consider this the most exasperating part of overhauling a single-action Colt. When functioning properly, the bolt is retracted from the locking notch and thus clear of the cylinder just before cylinder rotation starts, and it remains retracted until just before cylinder rotation halts, at which point it snaps back up into the lead-in cut adjacent to each locking notch.

If it does not do this, remove the bolt and hammer. Inspect the left rear limb of the bolt, and if it is excessively worn, the bolt will require replacement. There isn't any practical way to build up or repair that thin, spring-tempered section. This left limb must be springy in order to be cammed inward by the bolt cam when the hammer drops. Likewise, inspect the bolt cam on the hammer—it should look just like the photograph. If it is only moderately worn, careful filing and stoning will true up its surfaces and it will still function correctly so long as its height is not reduced below about Vie″ It should remain high enough so that its upper edge contacts the full thickness of the bolt limb.

If the bolt cam is badly worn, it must be replaced. The original is brazed or silver-soldered in place, so the hammer foot must be heated and the cam driven out. A new cam is made by filing the proper angle on the end of a piece of drill rod of a diameter to fit the hole snugly. The bevel is polished smooth and its edges lightly radiused. It is then pressed and silver-soldered in the hole in the hammer (maintaining the original orientation of the bevel) so that it protrudes the proper amount beyond the right hammer surface. The surplus rod is then cut off and filed flush with the left side of the hammer. Of course, if you use a replacement hammer, it will carry a new bolt cam of the proper dimensions, but one probably in need of stoning and polishing.

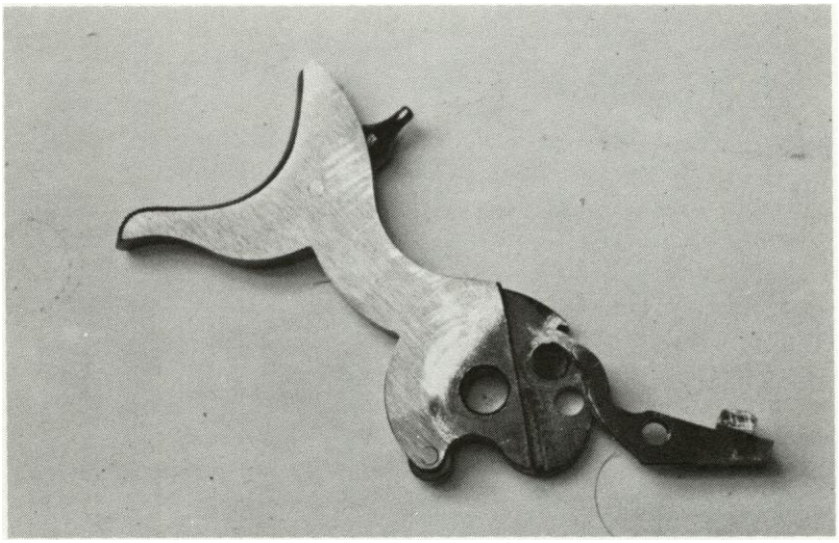


Spreading limbs of bolt may restore functioning if bolt and cam are worn so that limb slips off before bolt is fully retracted.



(Left): Bolt cam should be shaped as shown. (Right): Bolt cam should also be beveled as shown.

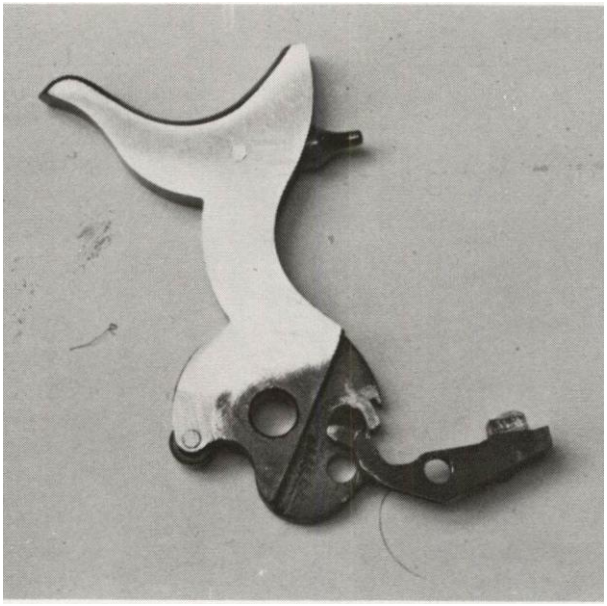
Now, with a new or good-condition bolt limb and bolt cam, ease the hammer back slowly toward full cock and ascertain that the bolt is retracted at the proper point and that it snaps back up at the proper point during cylinder rotation. If it is not retracted before cylinder rotation begins, excessive stresses will be placed upon both the bolt and the hand, and will result in peening the cylinder locking notches and the bolt hole in the frame, as well as excessive wear on the hand nose. If this does happen, the bolt must be replaced. A new bolt has always, in my experience, had sufficient metal on its left limb to provide proper and timely retraction.



Rear limb of bolt slips off lug on hammer just before full-cock is reached, and this is regulated by length of limb.

Often, a new bolt will not snap up soon enough and in this instance a very small amount must be stoned off the rear underside of the left limb so that it slips past the bolt cam just before the hammer reaches full cock. This should be regulated so that the bolt pops up into the lead-in cut at the locking notch, but not before. If it pops up too early, it won't cause any mechanical harm or malfunction, but it will strike the surface of the cylinder and mar the finish. If that condition is allowed to exist long enough, it will actually wear a groove in the finish part way between each pair of locking notches.

We still aren't finished with the bolt. When the trigger is pressed and the hammer falls, the bevel on the bolt cam strikes the upper outer edge of the bolt's left limb and cams it inward in passing, so that the limb then snaps back to the left and rides above the cam for subsequent cocking. By easing the hammer down slowly with your thumb, you'll be able to feel this contact. If the cam is not beveled deep enough at the bottom and if the upper left edge of the bolt limb is sharp, the cam may hang up there (rather than forcing the limb aside) and thus prevent the hammer from falling all the way. If you're easing the hammer down with your thumb, this won't cause any damage, but if the hammer is allowed to fall free and this occurs, it may break the left limb off the bolt.



As hammer falls, beveled cam exerts downward force on rear of bolt, keeping it solidly seated in locking cut. Parts must be polished smooth to avoid breakage and excess drag.

To avoid this or correct it, make certain that the bevel is polished down to the point where no shoulder is left at its low side to hang up on the top of the limb. At the same time, polish the left face of the limb and very lightly bevel its sharp, upper edge. Polishing the face of the bevel will also reduce the resistance encountered as the cam moves over the limb.

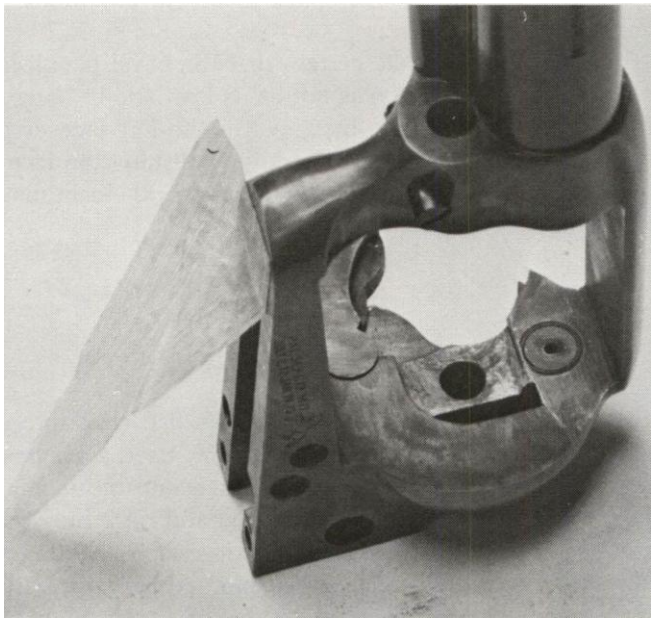
FIRING PIN AND FIRING PIN BUSHING PROBLEMS

At this point, you should have that old SAA in first-class internal order. However, there are still a few things that may need some work. Check the firing pin where it is pressed and pinned into the hammer. The nose of the pin may very well be badly pitted and rusted or worn. If it is, or if it does not protrude ·050- ·060″ from the face of the recoil shield when fully down, obtain a replacement pin and install it with a new cross pin. If you look closely on the sides of the head of the hammer, you will notice a pin or rivet which is barely visible. Drive it out and the original firing pin may be removed, after which the hole should be thoroughly cleaned and the new pin seated and secured with a new drill-rod retaining pin slightly riveted at both ends.

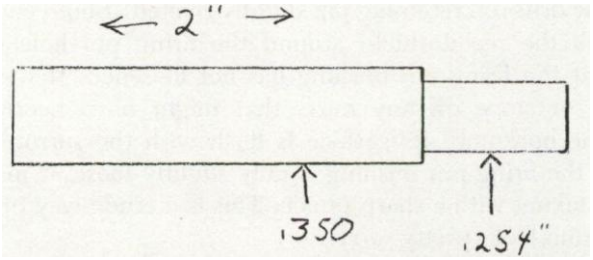
Check the recoil shield around the firing pin hole carefully to insure that the firing pin bushing has not loosened. If the bushing is tight, file or stone off any burrs that might have been thrown up around the hole until its surface is flush with the surrounding recoil shield. If the firing-pin bushing is only slightly loose, it may be tightened by staking with a sharp punch. This is a crude way of getting the job done, and looks pretty sorry.

It is far better to replace the firing-pin bushing with a new one. The original may be driven out from the rear by a punch that is somewhat larger than the firing-pin hole, but slightly smaller than the diameter of the firing-pin hole in the rear of the frame. Simply select a punch that fits, clamp the frame in a vise, and drive the offending bushing out forward.

Fitting a new bushing properly requires removal of the barrel to obtain access for a crimping tool. This tool must be made up especially for the job. It consists of a sharp-edged ring turned on the end of a piece of bar stock and rehardened. Alternatively, it could be made up by filing a piece of steel tubing. For this, simply file the proper inner and outer bevels and then reharden. With the old bushing removed, thoroughly clean, derust, and degrease its hole in the frame. Also degrease the replacement bushing and then apply Loc-Tite liberally to both the hole and the bushing and drive the bushing solidly in place from the front (using a flat-faced punch through the barrel hole in the frame). Make certain the bushing is seated solidly to the full depth of the hole and flush or very nearly so with the recoil shield.



Firing-pin bushing is pressed and crimped in recoil shield. It can loosen and require re-crimping.



Shop-made punch for driving out frozen SA Colt base-pin bushings from rear of cylinder.

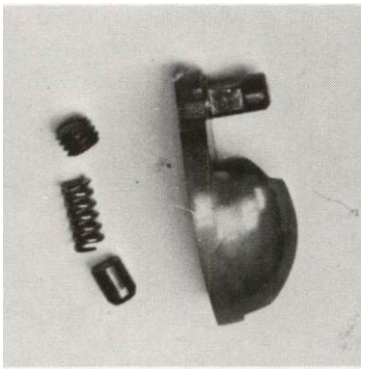
The new bushing must be crimped into place. This is accomplished by inserting the ring punch already described and very carefully aligning it with the perimeter of the bushing face. It must be aligned concentrically with the bushing and then struck sharply so that its hardened, circular edges bites into the metal of the recoil shield and forces the lip of the bushing hole over the slight bevel on the face of the bushing. Extreme care must be taken here for it is quite easy to strike the punch off center and mess up the job. If you're using a solid ring punch, it is a good idea to inlet a pin in the center of its face which will enter the firing-pin hole to help with alignment.

After installing the new bushing, you may find that it protrudes slightly above the recoil shield and thus reduces headspace below the acceptable minimum. If it protrudes very much, it will also snag case rims and interfere with proper cylinder rotation when the gun is loaded. So, very carefully file the excess off until it is either flush with the recoil shield or until the proper ·060″ headspace is produced. If the bushing still protrudes above the recoil shield when the correct headspace has been achieved, carefully bevel and polish the left side so that case rims will ride smoothly up over it and not interfere with cylinder rotation.

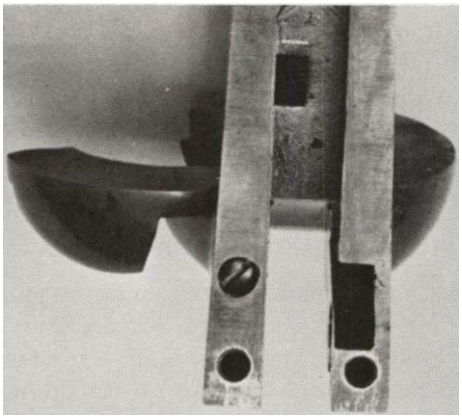
LOADING GATE AND EJECTOR PROBLEMS

Nothing much mechanical is left to do to the gun except to refurbish the ejector system and loading gate, if necessary. The latter first. If the original loading gate is not bent on its shaft (some are and thus lean forward and put pressure on case rims) nothing is normally required other than careful cleaning and polishing of the shaft, the hole in which it rides, and the plunger, followed by replacement of the plunger spring and reinstallation. If the shaft is bent, try carefully to bend it back straight while cold, using a light, soft hammer.

Before doing this, though, look closely to make certain that the thin section where it is attached to the gate proper isn't cracked. If it is cracked, it will need to be welded before straightening. If the shaft is too badly damaged to straighten and still fit smoothly in its hole in the frame, saw it off flush with the gate, then carefully center-punch and drill a shaft-diameter hole through the "ear". Then, cut a length of matching drill rod, radius one end, and silver-solder it in the hole. Finish by dressing the front of the gate smooth where the rod might have protruded slightly, and re-install. Then, operate the gate a few dozen times and remove it. Note where the detent plunger has marked the shaft. With needle files and hand grinder, duplicate the detent cut of the original shaft and polish as smooth as possible. The repaired gate should now work perfectly when lubricated and installed. Of course, it is much simpler merely to install a new gate.



Plunger, spring and screw are essential to loading gate function. Note detent cuts in gate shaft, which may bend or crack at this point.

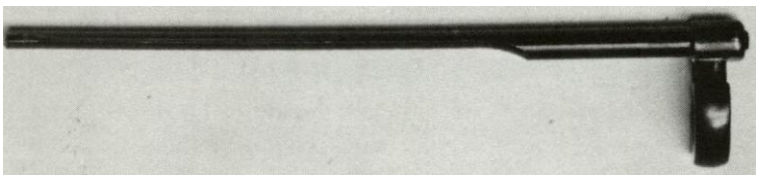


Loading gate screw must be turned out before gate can be removed for repair.

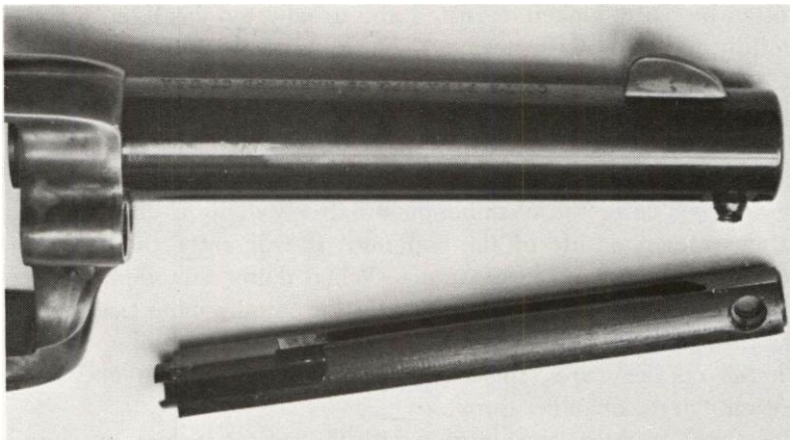
More often than not, ejector rods are bent where the thumb piece screws on, and they may also be bent or kinked in other places. Replacement rods, springs, and heads are available, but I have found that a new rod made from drill rod, of as large diameter as the hole in the frame will accept, is more durable and less likely to become bent than an original. Make the replacement rod the same length and thread it for attachment of the thumb piece. The old ejector spring will often be badly kinked or rusted and usually too weak to hold the rod solidly forward. A replacement spring will correct this, but somewhat better results will be obtained by winding a new one of heavier wire.

If you are refurbishing a SAA in a relatively small caliber or for one of the bottlenecked ·22 or ·25 calibers, the original ejector rod quite likely will not enter the chamber mouth freely. This is corrected by grinding away one side of the rod until it will enter the chamber mouth with a minimum of clearance. When doing this, don't simply slab off the rod flat. That will weaken it substantially more than if you radius the cutaway side to match the radius of the chamber mouth. Polish the cutaway area smooth and radius the working end so it cannot scratch the chamber throat.

The main problem encountered with the ejector system on abused guns is in the housing attachment screw. This is a short, small- diameter screw entering only a few threads into a stud on the barrel. Often the threads are stripped or badly damaged from over-tightening, or from firing while it is loose. Also, that slender screw and stud constitute the only surfaces absorbing the substantial inertia of the heavy ejector rod housing when the gun recoils. A good heli-arc man can weld up the hole in the stud, after which you can re-drill and tap it to accept a new housing screw. However, that often isn't enough— the housing must fit tightly over the stud because if there is any fore and aft play, the housing will simply act like a hammer against the stud with the recoil of each shot. I prefer to have the welder build up the outside of the stud as well, then carefully file it down to a tight fit in the housing. Actually, if the housing slips over the stud easily, it's too loose and will beat itself to death with any significant amount of shooting.



In smaller calibers, ejector rod must be thinned to clear edge of chamber mouth.



Ejector rod housing must fit tightly on stud or recoil will loosen it quickly.

Occasionally, the stud will be found sheared off completely. The only solution to that—if you are retaining the original barrel in its original caliber—is to have a new stud built up by welding und then carefully file it to shape. If, however, you are having the original barrel relined, you can simply drill out the original stud base and then silver- solder a new stud in the hole. Then when the relining shop reams out the barrel, they will simultaneously cut away the protruding portion of the stud and the new liner soldered in place will fill the bore perfectly. The liner has more than adequate strength to contain the powder gases, so you need not worry in the least about the stud blowing out.

DESIRED APPEARANCE AND FINISHING

The rest of the work on your SAA Colt will be purely cosmetic. You'll square up the contact surfaces of the trigger guard and back strap and neatly file away any nicks and dings, and if the straps have been bent—as sometime occurs—you'll very carefully use a lead hammer to rap them back into shape over various diameters of steel rod held solidly in a vise. Clean up the barrel, frame, and ejector housing the same way, and if the muzzle has been damaged, you'll carefully recrown it.

Then, if there's any external customizing to be done, particularly the fitting of sights or ribs, you can accomplish them in accordance with the pertinent chapters in this volume. Finally, you'll probably want to refinish the entire gun. Certainly if you've done any welding or bushing or peening here and there on it, a refinishing job will be necessary. Rebluing presents no great problem, and it's covered in detail elsewhere.

If you want fancy finishes such as nickel, chrome, gold, silver, etc., you'll be far better off to ship the parts away to a specialist. Not only will he probably do a better job than you can, but if the job doesn't suit you, you'll have somebody to bitch at.

Last of all in the refinishing area is color hardening. Very few, even the professional finishing shops, can do a decent job of color hardening that will look in character with the finish originally applied to the SAA frames, loading gates, and hammers. If the professionals don't do a perfect job on this, it's really not very likely that you will. If you insist on trying it yourself, I refer you to the book Firearms Bluing and Browning (Angier), and if you can find one, a real oldie, now out of print, Modern Gunsmithing (Baker). They go over the process in detail, and if you follow their instructions closely enough, and practice enough, you can probably turn out a creditable job. But in the end, I am absolutely positive that you'll be far more satisfied with the final results if you simply clean up the parts, then very carefully polish them and ship them off to a specialist in color hardening.

COLT PERCUSSION MODELS

It should be mentioned here that virtually all of the things we've discussed here, with the single exception of reworking barrels and ejector rods, apply equally well to Colt-style percussion revolvers, whether of ancient or modern vintage. Virtually all of today's modern percussion revolvers copy the Colt mechanism exactly in function, if not in dimensions, with the single exception of the M1858 Remington reproduction. Consequently, if you encounter repairs to this type of percussion revolver, simply go back over the foregoing pages and pick out those jobs and processes which match.

There are two areas in the Colt percussion revolver that do differ. Their barrels become loose on their base pins, and the base pins loosen in their frames. The latter must be corrected before anything can be done about the former.

The base pin is screwed into the frame from the front, then keyed with a blind pin driven into both the frame and pin from the rear. Some reproductions delete the key pin and merely stake the base pin in place. If only minor looseness is evident, staking the frame around the pin at both front and rear will solve the problem.

Serious looseness requires that the key pin be drilled out and the base pin unscrewed from the frame. Then, after thorough cleaning of the parts, silver solder is flowed on the base pin threads; it is screwed back in place; pinned and staked, and heat is applied to melt the solder. This produces a permanent repair. Of course, if a proper replacement base pin is available, it may be installed instead.

Fore and aft or rotational barrel looseness is due either to a worn or undersize wedge, or a worn wedge hole in the base pin. The best approach is to fit an oversize wedge, but if one is not available, peening the edges of the hole will correct minor looseness, at least temporarily. A better and more permanent repair is obtained by welding up only the edges of the hole, then carefully filing to a close fit on a new wedge. I've also seen steel shims silver-soldered inside the hole to accomplish the same end. If the base pin is undersize for the barrel hole, plating or metallizing to build up the pin is the only method that allows retention of the original part, but a new pin is better.

If the barrel alignment pins on the front of the frame are badly worn or broken off, drill holes and drive or solder in new, oversize pins of drill rod and then carefully open up the holes in the barrel to match.

MODIFICATIONS FOR FAST DRAW

So much for the venerable SAA Colt and all of its older and newer relatives. While the foregoing suffices to put the SAA Colt in first-class condition for conventional shooting, there is a specialty area that calls for further work and some alterations. The devotees of Fast Draw have as their goal the drawing and firing of the SAA Colt in the shortest possible time, measured even in minor decimals of a second. This shooting is all done with blank cartridges loaded specifically for the purpose.

Since the legendary practice of fanning the hammer is allowed in this game, certain modifications to the gun are required to make it practical. Fanning consists of sweeping the off hand horizontally along the topstrap of the gun to strike the hammer spur with the heel of the hand, driving the hammer rearward toward full cock. The trigger is held back while this is done, so as soon as the hand clears the hammer spur, the mainspring drives the hammer forward to fire.

Even though a glove is often worn on the fanning hand, it is obvious that the sharp checkering on the hammer spur must go. So, the first step is to grind off the checkering and polish the upper surface of the spur glassy smooth. Some fanners then want the sharp upper edge of the hammer face radiused or beveled to prevent its digging into the hand as the hammer rotates. A good bit of metal can be removed here, so long as approximately 1/16-inch of metal is left above the firing-pin hole.

If the gun is to be used exclusively for fanning, some shooters will also want the safety and full-cock notches ground off smoothly to eliminate the possibility of their being inadvertently engaged by the trigger. The man who isn't concerned about speed of reloading may also want the loading notch removed for the same reason. Some will also prefer to bend the original hammer spur upward a bit, to provide a better striking/sliding surface for the fanning hand, or even to extend its length a bit.

Bending is simplest, and if some metal is first ground away from the bottom of the spur, the job will be easier. Either way, the hammer must be clamped very tightly in a vise, then the root of the hammer spur is quickly brought to red heat with an oxy-acetylene torch, and a brass drift and hammer are used to bend it upward the desired amount, striking about midway on the underside of the spur. After bending, the spur can be extended by welding buildup, then filed, ground, and polished to the desired shape. Individual shooters' tastes differ, so there is no standard shape or dimension.

If the gun is to be mainly thumb-cocked, rather than fanned, entirely different hammer spur alterations are required. Again, the shooter's technique and hand size control the final result. Generally, though, the spur is bent downward, and a bit sideward toward the shooting hand. For a short thumb, the top of the spur may be ground down a good bit. Sometimes so much is removed that it is necessary to build up beneath the spur to reinforce it, or the spur may simply be cut off and welded back on slightly lower.

Really, the variations in hammer spur shape for both fanning and thumb cocking are almost endless. On the other hand, when both fanning and thumb cocking are to be used, the original spur shape is hard to beat. It needs little improvement other than polishing, and grinding away its underside slightly to reduce weight.

After all that, the hammer must be cleaned up, polished, and rehardened and drawn. However if it is desired to reduce the hammer's weight for faster action, it should be done before rehardening. Simply drill holes through the hammer as shown, then if desired, file away additional metal to join the holes. If this is done, be certain not to leave sharp angles to act as stress raisers and cause breakage later. It is also wise to leave at least 1/16-inch of metal around any holes or cutouts made.

Reduction of friction is important in fast-draw guns, so every moving part must be polished as smooth as possible where it will rub its neighbor. Pivot screws and pins must also be very smooth. The cylinder base pin can be relieved except for 1/4-inch-wide bearing surfaces at front and rear of the cylinder, thus cutting down there a bit on friction. This is easily done by boot-blacking the center of the pin with strips of abrasive cloth—only about ·005-inch needs be removed. To further reduce friction, timing and alignment can be deliberately loosened a bit, and the left limb of the bolt can be tapered toward its rear. Also thin the bolt cam to the minimum that will still function the bolt properly, and polish it glass smooth.

Fanning places a heavy load on the surfaces which stop the hammer's rearward motion. Wear can be reduced by welding up a lump on the topstrap directly behind the hammer, then carefully shaping it to halt the hammer just as cylinder rotation is complete. Shape the surface for maximum hammer contact and then caseharden the surface.

The cylinder is the heaviest moving part of the gun, and any reduction in its weight will reduce wear and tear on other gun parts, as well as the shooter's hand. It will also make operation faster and smoother.

So long as only blanks are to be fired—conventional blanks, not some high-pressure handload-—the cylinder can be lightened slightly. The cylinder flutes can be deepened with a hand grinder. Deep holes parallel to the chambers can be drilled between each pair of chambers next to the base pin. Smaller holes can be drilled centered in the triangle formed by adjacent chambers and the flute between them. All edges can also be beveled or radiused—so long as the chambers aren't encroached upon—to trim off a wee bit more weight. Even the outside diameter of the cylinder can be polished down a little so long as it isn't reduced right at the bolt cuts. The flutes may also be extended rearward so long as the bolt doesn't hang up on their edges as the cylinder rotates. Conceivably the flutes could be extended fully to the rear after the fashion of the full-fluted Colt percussion revolvers of the 1860s.

In short, anything that can be done to reduce friction and weight of moving parts should speed up the gun's functions for both fanning and thumb-cocking, but remember that fanning places abnormally high loads and stresses on all parts. If they are much weakened, they'll break or have a short service life.

CHAPTER 18 - Customizing Revolvers

Since the first genuinely practical version of Sam Colt's revolvers came on the scene about 1847-49, the venerable wheelgun has been the subject of more alterations and changes than one would imagine possible. And the practice hasn't declined in recent years, if we may judge by the letters coming in and the guns that are brought by now and then for examination.

It might seem that there isn't too much to be done to such a simple and a long-evolved functional mechanism as the revolving-cylinder repeating pistol. After all, it's been with us nearly 140 years and has been continually molded to fit the needs and desires of the American pistolero. By now it would seem that it has reached definitive form in both single-action and double-action variations. In the main sense, it has—for modern revolvers met more of the needs of more people than ever before. In style, design, function and performance, they will serve most shooters quite well, just as they come from the factory.

I say "most shooters" because perhaps ten percent of our sixgun owners are sincere enthusiasts, who seek by all means possible to improve accuracy, power, reliability, handling, concealability, etc. at any cost. If a real gun buff feels a 3½-inch barrel will serve his needs better than the 3-inch and 4-inch versions available from the factory, he'll get it changed to that, one way or another. If he wants higher or lower, wider or narrower sights, he'll get them, too. The same is true of any change conceivable within the basic design limitations of today's revolvers, and even of many which involve extensive redesign.

SOME TYPICAL MODIFICATIONS

Typical modification or customizing jobs involve the following:

1) Shortening barrel and/or butt to improve concealability, combined with fitting new sights when necessary.

2) Installation of adjustable target sights on a fixed-sight model, not necessarily for serious target shooting.

3) Double-action tuning for combat-type shooting.

4) Removing excess metal and protuberances for increased concealability and handling ease as a hideout defense arm.

5) Change caliber either to merely restore shootability or to use some wildcat or non-standard cartridge to meet some real or imagined need.

6) Installation of scope sights for hunting use, sometimes combined with extra-length barrels.

7) Installation or integral forming of muzzle brakes to reduce recoil and jump—either to improve handling with extra-powerful loads, or to improve control in serious target shooting with light loads.

8) Application of special finishes not offered by factories and application of engraving, inlay work, or other decorations.

9) Relining or reboring barrels and cylinders to restore performance in the original or some other caliber.

10) Installation of special hammers and triggers, trigger shoes, trigger stops, etc. for various uses.

11) The full-house National Match style single-action, target conversion consisting of special barrel, very precise sights, and complete lockwork overhaul.

12) The full-house combat conversion which may include many of the foregoing.

13) Installation of replacement stocks to suit use and shooter's physique and preference, sometimes including frame butt alteration.

Of course, there are hundreds of variations of the foregoing jobs, and many general customizing projects involve several of the listed procedures. While some of the work can be done at home by the owner with only a few hand tools, others require extensive experience and even a well-equipped machine shop.

In the order they are already listed, let's take a look at which of the jobs you can do yourself, along with some ideas on getting the rest accomplished elsewhere.

(1) With a hacksaw and a file, anyone can cut off a barrel, dress the muzzle smooth, and bevel the outer edge. First, the cut-off point must be established far enough out to avoid cutting into the forward lock of the S&W, and in other designs to leave the barrel a bit longer than the extractor rod for its protection. Mark the cut as squarely as possible with a round of tape, then hacksaw to the line with a new, high-speed, steel blade. File smooth and square, then bevel the outer edges. Break the inner edge with a countersink, if one is at hand, otherwise, use fine, abrasive cloth rotated on the ball of your thumb.

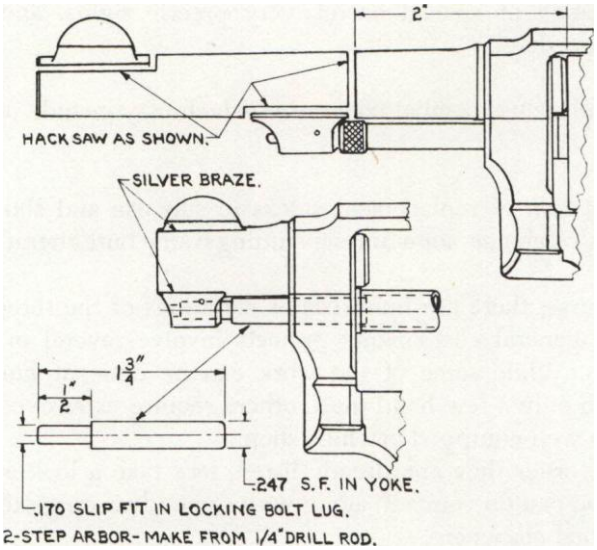
Soft solder won't hold a new front sight well enough, so use silver- solder or screws to secure a higher replacement in place.

(2) Sight replacement and installation is covered elsewhere.

(3) DA tuning can be done at home, with lots of patience and careful use of Arkansas stones and common hand tools. It's too lengthy a procedure to describe here; it's covered separately.

(4) This involves only files, stones, and perhaps a Moto-Tool hand grinder. Grind or polish serrations off the trigger face for smooth, sliding trigger/finger contact; if more finger room is needed, cut away half the width of the trigger guard forward of the trigger tip and up to the frame;* file off all the sharp edges on the frame; round off the corners of the butt frame and remove excess wood from stocks to match; cut off hammer spur to prevent snagging on clothing and blend cut into a smooth curve. Do not remove metal where hammer contacts frame in coming back to full cock; shorten barrel to suit; and fit low profile sights as desired.

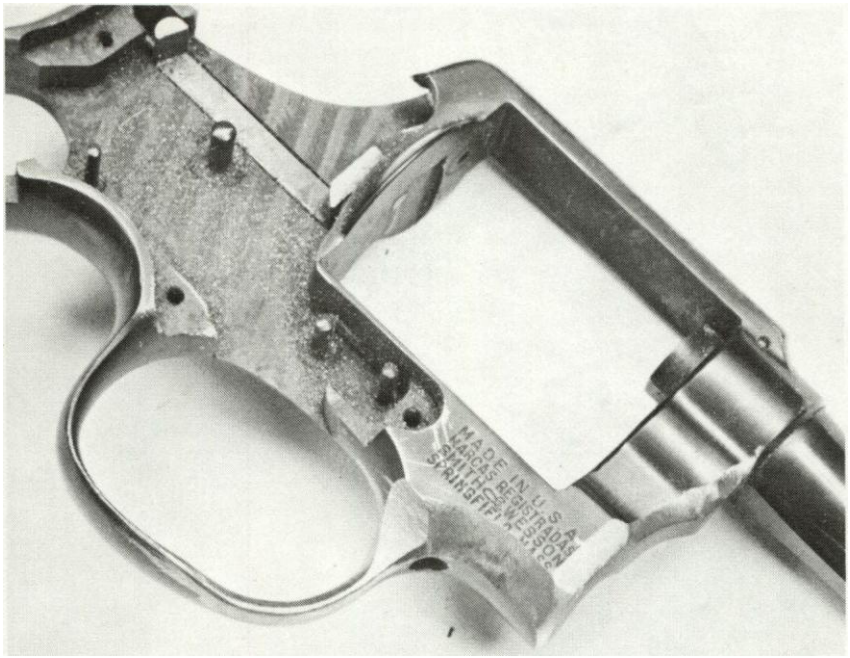
* Take care to avoid cutting into the inside of the frame, or interfering with the bolt spring screw of older S&W models.



When shortening S&W revolver barrels beyond the original underlug location, the above system allows retention and full functioning of the front lockup; make arbor snug fit in crane to align underlug for brazing in new position. After sight and underlug are refitted, shorten extractor rod and center pin to match. The same system may be used on those S&W models with shrouded ejector rod.

(5) Most standard models are offered in more than one caliber, thus by simply installing a new barrel and cylinder of a compatible caliber, the caliber can be changed—assuming, of course, no switch from rim to center-fire or vice versa is involved. We have also covered these operations in detail elsewhere.

(6) Scope mounting is a fairly easy home job. With care, the requisite holes in the top strap can be drilled with a hand-cranked breast drill, or a portable electric drill, but a small drill press will be a big help. The mount base is contoured to fit over the base strap. Once it is clamped or epoxied in place per its accompanying instructions, it may be used as a guide to spot and drill the necessary holes. They can then be tapped by hand, using a discount-store tap wrench. Screwing the base solidly in place with a drop of Lok-Tite on the threads completes the job. See chapter on sights for more details.



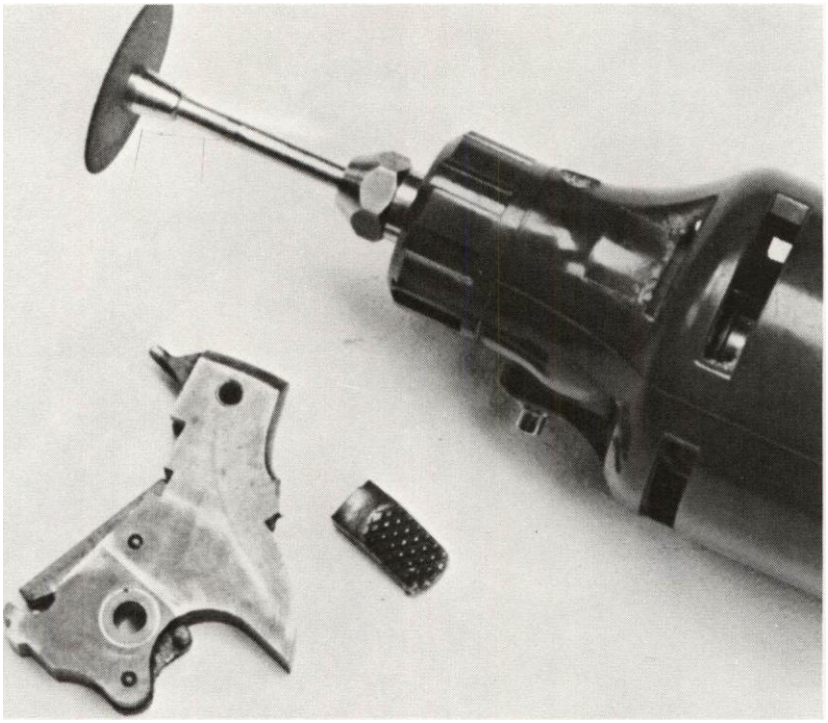
Once the front portion of the trigger guard has been properly narrowed, additional bulk and weight can be removed by filing broad bevels on various edges of the frame. Just take care not to cut into any internal cavities.

(7) Currently-available separate muzzle brakes clamp right on the muzzle without any special tools or attention. Those machined-in ports and brakes such as Mag-Na-Port are purely shop jobs; no way you can do them at home.

(8) Special finishes are usually the purview of the specialty shops. Several of them offer superb work in gold or silver, and in matte or polished nickel or chrome. There are also combinations of the foregoing, and there is black chrome and the unusual and very durable Armoloy plate. See refinishing chapter for do-it-yourself jobs.

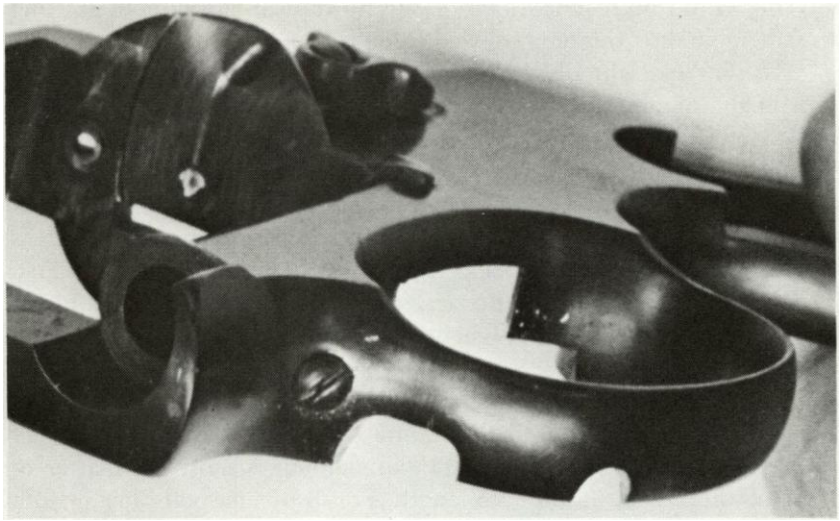
(9) When chambers and/or bores have become damaged, rusted, or badly worn, relining will restore them to the original caliber, as described under relining and reboring. Fortunately, there are a few shops specializing in this sort of work and doing it at quite reasonable prices—one such is David Woodruff, 116 Stahl, Wilmington Manor, New Castle, Delaware 19720.

(10) Installation of target hammers and triggers can be done at home with nothing more than the stones needed for polishing and hand fitting. New parts are generally functionally interchangeable and require only careful matching and stoning to produce smooth functioning and a first-class trigger pull. Trigger shoes and stops are simple bolt-on accessories and can be installed in minutes by even the most ham-handed mechanic. As always, just follow the simple instructions, and also refer to the section on revolver tuning.



Dehorning the hammer is simple using the Dremel Moto-Tool with a cutoff disc. Note that at least 1/16-inch of the flat surface beneath the hammer spur must be left intact to function as the hammer stop when the hammer strikes the revolver frame in its rearward travel.

(11) The full-house target conversion is a specialist's job. Unless one has a well equipped shop and considerable experience, it should never be tackled at home. Several shops specialize in this work, one of which is Austin Behlert, The Custom Gunshop, 33 Herning Ave., Cranford, New Jersey 07016. Behlert's typical job consists of fitting a new, heavy barrel and special sights, and a complete overhaul and tune up of the action for precise timing and trigger pull, along with any hammer or trigger alterations desired to facilitate control.



Cutting away half the width of the front of the trigger guard is most easily done by using a round file to cut notches at either end of the area, and then remove metal between them with a flat file or hand grinder.

(12) The full-house combat conversion is almost within the abilities of the home mechanic. Most important is production of the best possible double-action pull, often combined with eliminating the gun's single-action capability entirely. That is usually a job for a pistolsmith, but if you don't mind reading up on the subject under DA tuning, a creditable job can be done at home. The rest of the conversion is relatively easy, consisting of the operations in 1, 4, and perhaps 5 or 8.

(13) Anyone can install a pair of Herrett's Shooting Ace or similar stocks in minutes, thus improving the gun's point-shooting capabilities greatly. The same applies to fitting any commercially available replacement stocks. If combat-style stocks are being installed, and individually fitted to the shooter's hand, it is sometimes necessary to reshape the front corner of the frame butt or the backstrap. These are simple filing or grinding operations, working the metal down flush with the wood of the stocks.

TOWARDS EASY COCKING

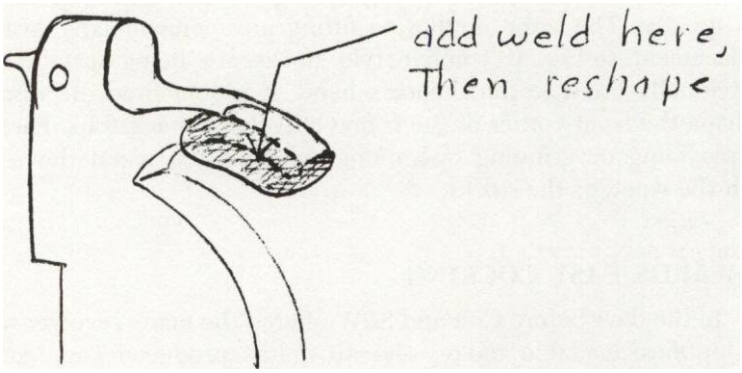
In the days before Colt and S&W offered the many revolver target-use options available today, several 'smiths produced easy cocking, speed action conversions for the NRA-type shooting. Easy cocking was achieved by welding up the hammer spur to greater width and reshaping so it could be reached more easily by the thumb without shifting one's hold, and by thinning or weakening the mainspring.

To duplicate the old King "Cockeyed Hammer", pack all but the spur of the hammer in wet asbestos and build up the left side (for a RH shooter) of the spur by welding. Follow by filing and grinding to the shape shown, thinning the spur from above and beneath to keep overall hammer weight down. Then, using a soft drift, bend the spur downward until it falls within easy thumb reach, or until it barely fails to contact the frame at full cock—whichever condition is reached first. On some hammers, it may be necessary to cut away a good bit of metal on the upper surface, where the spur joins, before it will bend easily.

Once this is done, more reshaping should be done, particularly on the leftward extension, until the thumb can reach the spur easily, yet have good purchase for cocking. Final shaping is mostly a matter of personal preference and thumb length. Finish by first polishing smooth and then serrating or checkering the spur surface with appropriate files.

If care was taken during welding to insure the critical notches and bearing surfaces of the hammer were not overheated, then, the job is finished. Otherwise, though, the notches should be rehardened and the entire hammer heat-treated.

Reduction of mainspring to ease cocking is done just as described under DA tuning, but with care, it may be reduced a little more. This is possible since SA hammer travel is greater and thus positive ignition may be had from less spring power. In theory, hammer travel—therefore lock time—may be speeded up by lightening the hammer. This is done by carefully drilling and/or grinding away excess metal at the thicker areas. If hard drills are available, this can usually be done without annealing the hammer first. Annealing makes drilling easier, but necessitates hardening afterward. I've always considered such skeletonized hammers of dubious value, but that is how it is done. There are instances of skeletonized hammers breaking at inopportune times, so take care.



Cockeyed hammer is made up by adding weld metal to left side of spur, then reshaping. Spur may also be bent down or sideways to suit.

SHORT-ACTION ALTERATIONS

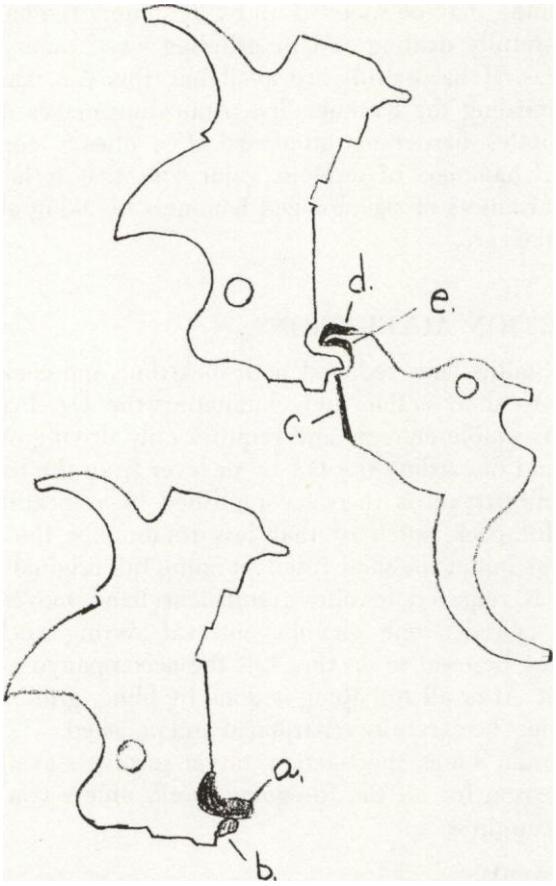
Some 'smiths have reduced both lock time and cocking travel by converting to short action and eliminating the DA feature entirely. The latter is simple enough, and requires only driving out its pin and removing and discarding the DA fly or lever from the hammer. Shortening hammer travel is then accomplished by relocating the trigger nose and full-cock notch so that less rotation of the hammer will engage them, but at the same time, retaining full original trigger travel. The latter is required to obtain sufficient hand movement to fully rotate the cylinder one chamber-interval during cocking. Several methods may be used to do this, but the accompanying sketch shows the simplest. After all reshaping is done by filing, grinding, and bending, parts must be carefully rehardened and polished.

With today's fine, short-action, target revolvers available, there is really no reason for all the foregoing work, unless you just want to prove you can do it.

WIDE TRIGGERS

S&W N-frame, wide triggers have become fashionable (and desirable) in recent years, the demand developing from Smith & Wesson's so-called Target Trigger. More recently Colt has also offered a wide trigger as optional equipment. Wide triggers are thus available as replacement parts for most recent models and can be fitted if desired. All this is fine if your particular gun is one for which a wide replacement trigger may be purchased, but, otherwise, some extensive rebuilding is necessary. The trigger of any modern DA revolver, with the single exception of the Ruger Security-Six and its variations may be built up to any practical width.

The most workmanlike job results from building the edges of the fingerpiece outward by welding, then grinding, filing, and polishing to the desired shape. However, this much welding destroys the heat treatment of the balance of the trigger and requires re-heat treatment after the job is finished.



1. Weld up at a., then reshape to form new full-cock notch about 1/16″ ahead and Short Action, Smith & Wesson, SA only, above the original notch.
2. Grind clearance at b.
3. Grind clearance at c.
4. Build up trigger nose at d.
5. Grind relief at e., then reshape trigger nose.
6. Hard-fit hammer and trigger so that hammer comes to full-cock with less travel, while trigger retains the full travel needed to rotate cylinder by means of the hand.

A perfectly satisfactory job can be done by rough shaping side extensions, then sweating them in place with a low temperature silver-fusion solder. Carefully done, this won't draw the temper from the critical areas of the trigger. Sides may then be shaped and polished to suit your preference. The only drawback to this is the line of silver that will be visible at the joint. If you fit the parts closely enough and polish the trigger bright, it will hardly be noticeable. Checkering or serrations will make the joint line virtually invisible.

BARREL SHORTENING

At times it is desirable to shorten long revolver barrels. This doesn't present any problem in the older Colts (pre-Mark III) since the ejector rod is easily chopped off and re-threaded for its head if the barrel is to be made ultra-short. The rod should never be allowed to protrude past the muzzle or it will be easily bent and jam the cylinder.

Mark III Colts can be shortened the same way, but if the cut removes the closed end of the ejector rod housing, a thin plug should be silver-soldered or welded in place to close the front of the slot.

Smith & Wessons present an entirely different problem. An essential part of the cylinder-locking mechanism is housed in the barrel underlug. Thus the barrels can't be shortened below about 3⅜ inches without cutting into this area; K- and J-frame models can be trimmed a bit more, but not much.

On S&W guns with unshrouded rods, the job isn't too difficult. Before cutting the barrel to length, very carefully saw out the underlug. Then, shorten and re-thread the ejector rod and the centerpin to match the length that will produce the barrel length you want when the underlug is reinstalled. Reassemble the ejector rod and file any clearance cuts necessary in the barrel. With the cylinder closed, carefully file a seat for the cutoff lug on the underside of the barrel, then fit the lug in perfect alignment with the ejector rod and centerpin.

Clamp or wire the lug in place (inner parts removed, of course, to protect them from heat) and silver-solder to the barrel. When cooled, cleaned, and reassembled, the locking system should work perfectly— then you can cut and crown the barrel flush with the front of the lug.

This isn't an especially difficult job, and I've shortened N-frame barrels to as little as 2½ inches in this fashion. Theoretically the barrel could be made much shorter, but take care that sufficient ejector rod travel is retained to push cases completely clear of the chambers.

Shrouded-rod S&Ws are only a little more difficult. For them, the procedure is the same except that the shroud must be cut as shown to free the lug, then cut back the same amount that the lug is to be moved rearward. Then, fit the lug (actually in this case, the front of the shroud) carefully to both barrel and shroud, then silver-solder. No sweat, if you're careful. Of course, there is the alternative of simply sawing the shroud off flush with the underside of the barrel and refitting the lug—but that makes for a sloppy job.

There are other operations described elsewhere in this volume that may be applied to revolvers. The topstrap and butt frame may be stippled, serrated, or checkered; the top of the barrel may be stippled or sandblasted to reduce glare; the trigger may be smoothed or checkered, etc., etc. As you read through these pages, other ideas will occur. If they seem within your capabilities, don't hesitate to try them.

CHAPTER 19 - Rebuilding an Autoloader

The temptation to pick up a doggy-looking, trade-in auto at the corner gunshop for a bargain price—with the intention of restoring it to pristine newness and greater value—is often almost irresistible. I've succumbed to it many times, and known a few kitchen table pistolsmiths who made some modest regular profit that way.

Actually, rebuilding a clunker auto isn't especially difficult, providing it is a model for which parts can be obtained or made easily. Another factor to be considered carefully is whether its market value when repaired will be enough to justify the effort. This is even more important today, when the gunshop price spread between "lousy" and "good condition" for most models is at an all-time low. For example, a decade or so ago a junker ·45 Auto could be had for 1/3 to 1/2 the price of one in top condition, while today the top-condition gun will bring around $125, and even a real dog will cost you 2/3 of that amount.

If you're looking for a gun(s) to rebuild (and this applies to revolvers as well) shop for parts before looking for guns. Obtain the catalogs of parts houses like Numrich Arms, SARCO, Fenwick, and the like, and also clip the big ads other parts houses run in the Shotgun News and other publications. Study these listings and learn for what makes and models parts are readily available. Then, armed with a good knowledge of parts availability, you'll be better qualified to determine whether a certain gun repair or rebuild is likely to be practical or even possible.

One of those very nice little Sauer M38 pistols of WW II, for instance, is no bargain, even at $25, if it is missing the cocking lever and other parts you can't obtain. On the other hand, a contemporary Walther PP with a ruined barrel and broken sear would be worth twice that price, since those parts are available.

Keep the cost of parts in mind, as well as their availability. I was recently offered a very clean wartime Browning P35 at $60 "with just a few parts missing." Sounded great, since there are plenty of P35 parts available—but when current prices of a trigger, sear, hammer, and safety were added to the sixty bucks for the gun, it became evident it wasn't much of a buy after all. In fact, I could buy a comparable complete gun for about the same total price, and not have to work on it nor wait for the parts to come in.

Often that's the situation you'll encounter—what looks like a good buy at first turns out to be too costly by the time repairs are completed. And, often the obvious repairs or parts requirements may be doubled by the time hidden needs are met.

To avoid getting stuck with extra hidden repairs, you must learn to check a gun out thoroughly. Not only will this prevent your getting stuck, but if you can identify defects and point them out to the seller, it seems reasonable that he can be persuaded to cut the price by at least the cost of the parts, possibly even more.

HOW TO CHECK FOR REPAIRS NEEDED

Let's set up a standard procedure for checking an autoloader to determine just what repairs it might need.

1) Inspect externally for condition of finish, tightness of assembly, presence of all parts, surface damage.

2) Remove magazine and inspect for rust, dents, bent or cracked feed lips, and follower and spring operation. Carry a length of 1/4-inch dowel to depress followers through their full travel and note how they function. Check magazine catch notch or seat for excessive wear, then replace in gun and check security of magazine retention.

3) Thumb-cock the gun, test trigger pull for weight and smoothness (several times). Recock and check manual and/or grip safety functioning. Cock and retract slide about 1/4-inch and check disconnector by pressing the trigger. If the hammer falls, something is wrong.

4) Retract slide fully and check that slide stop engages properly, then manually check both slide stop positions for proper and easy manipulation.

5) Check for excessive barrel looseness and freedom of movement with slide at both extremes of travel.

6) Use a screwdriver and small drift to check all screws and pins to insure they seat solidly and will stay in position, and that threads are not stripped.

7) Dismount slide and barrel and inspect all visible parts for condition, especially for excessive wear, cracks, corrosion, and previous poor repairs.

8) Examine bore and chamber closely for wear, pitting, rust, and erosion—new barrels are very expensive. Be prepared with a cleaning rod and stiff bore brush for this job. Many sellers deliberately do not clean bores, preferring to say "Sure, it's dirty, but it'll clean up fine." Do that cleaning before buying and you'll know how well it will clean up.

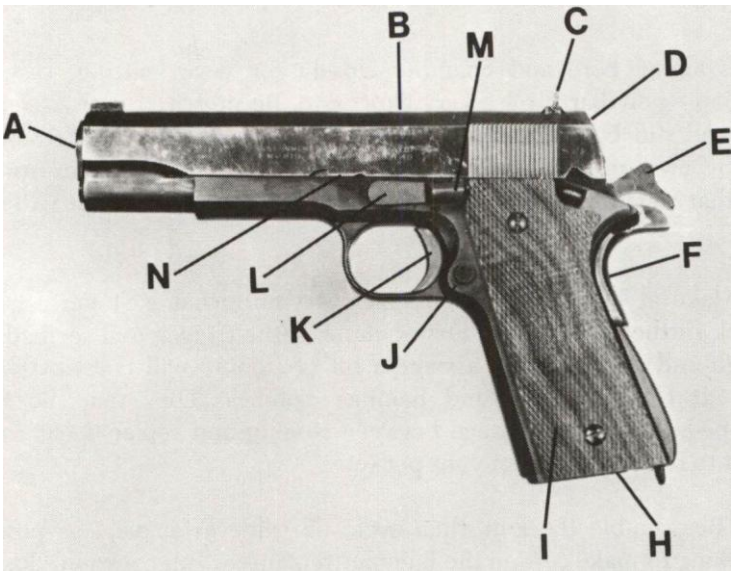
9) Make at least mental notes on everything that isn't perfect, then check further, if possible. For example, if the trigger pull seemed very rough and ragged, don't assume a bit of stoning will cure it. Instead, look at the sear nose and hammer notches. They may be badly chipped, and the difference between stoning and replacement can be eight to ten dollars out of your pocket.

10) Reassemble the gun, then cycle the slide as smartly as possible, checking to make certain the hammer remains at full cock and does not "follow down."

11) Ask for permission to test-fire the gun. Many shops have a firing pit or bullet trap for this purpose in the back room or basement. Those who don't may be reluctant to let you take the gun out to shoot it unless you leave a deposit, but don't let that bother you. A deposit is a perfectly legitimate request, so long as there's an agreement to return it if you find the gun defective. Test-fire the gun with a full magazine of standard cartridges. If it malfunctions, find out why. If there is more than one magazine with the gun, test fire with both. A magazine that doesn't feed properly is worth nothing to you.

12) Then, after all this has been done, run over in your mind (or notebook) the cost of repairing the gun to the level needed to make it (1) safe and functional, (2) saleable at a profit, or, (3) suitable for your own use. Add that to the asking price, throw in something for your time and effort, and you'll know whether the gun is worth buying.

All this may sound like a long winded, time consuming operation, but it isn't. With knowledge of the gun and a bit of practice you can check an auto out completely in less than five minutes, exclusive of test firing. A complete checkout of what at first looks like a good buy can easily save you a fair amount of money, making that few minutes some of the best-paid time you've spent.



Check all these points closely for proper fit and functioning on the average, big-bore autoloader: (a) looseness of barrel and bushing; (b) excessive barrel looseness in breech; (c) loose sights; (d) freedom of firing-pin movement; (e) proper engagement of all hammer notches; (f) correct functioning of grip safety; (h) smooth insertion and withdrawal of magazine; (i) condition and fit of grips; (j) functioning of magazine catch; (k) smoothness and weight of trigger pull; (I) proper and positive functioning of slide stop; (m) condition of slide stop and disassembly notches; (n) closeness of slide-frame fit.

NOTES ON PARTS REPLACEMENT

Rebuilding is the title of this chapter, and all that's been discussed so far is checking the gun out to see whether it is worth rebuilding. With most autos—at least those that are worthwhile—rebuilding is simply a matter of replacing parts. The typical big-bore auto such as the Colt or Browning is designed for complete replacement of all parts with minimum tools. A vise, a screwdriver to fit the grip screws, a couple of small drifts or punches, and a plastic hammer will allow any or all parts to be replaced in only a few minutes. I have, in fact, completely stripped both models down to the bare frame, then replaced every single other part with a new one in less than ten minutes without hurrying. Anyone who has studied parts drawings and disassembly instructions, and then taken a particular gun apart a few times, can do just as well. I might add that this is the method used to overhaul military sidearms and restore them to full serviceability.

The smaller center-fire and rimfire autos are often just as simply and quickly overhauled, with the single exception that the barrels in some models are fixed in place, and they also sometimes require using a few more tools. A pair of needlenose pliers, a couple different screwdrivers, and perhaps different-size punches is about all that will be required for all but the barrel.

NOTES ON BARREL REPLACEMENT

Barrel removal usually isn't difficult once you've determined how it's fixed to the frame. The Walther PP series, for example, has its barrel pressed into the frame boss from the rear, seating on a shoulder in the boss, and cross-pinned at the lower front of the boss. For it, the crosspin must be drifted out, then the barrel carefully pressed out rearward.

Some other models have their barrel threaded into a frame boss from the front, then cross-pinned; some are merely threaded without pinning; at least one is threaded in from the rear; and one or two have the barrel a slip fit into the boss from the rear and secured by a nut or pin up front.

When barrel replacement or repair is being considered on any auto which has a fixed barrel, care must be taken to make certain how the barrel is fitted and retained. Once that is determined, removal and replacement procedures will become apparent.

There are, incidentally, a few older models such as the M1908 Bayard ·25, ·32, ·380 pistols in which the barrel is an integral part of the frame; a portion of the frame is simply drilled, reamed, and rifled to form the barrel. This form of construction is usually obvious, and there is no practical way to replace such a barrel, though it can usually be relined or rebored if the cost is justified.

Aside from what's already been discussed, particularly on replacement of parts, there really isn't much to say in regard to rebuilding autos. Naturally, it is often practical or necessary to repair individual parts rather than simply replace them. This type of work, encompassing relining and reboring barrels, welding up and reshaping parts, making new parts, rehardening, refinishing, etc. are all covered in considerable detail elsewhere in this book under their own headings. Refer to those chapters as pertinent to the next job you have in mind.

CHAPTER 20 - Rebuilding Revolvers

The last chapter dealt with rebuilding autoloading pistols which generally are quite easy to work with. Revolvers are a bit more complex and simple replacement of parts often won't get the job done.

First, though, keep in mind that all the preliminary work described for autos is equally necessary with revolvers. First, you should know for what guns parts are available, and their approximate cost. Then the gun should be carefully inspected to determine as accurately as possible how much cost and effort will be required to put it in serviceable condition. This can be a bit more sticky with revolvers since in them the replacement of one defective part can sometimes require the replacement of an interacting part in order to obtain proper functioning. This is usually not encountered in autos. Many of the inspection operations described for autos apply equally to revolvers, but the wheelgun being the special breed of cat that it is, quite a few other points must be checked.

HOW TO CHECK FOR NEEDED REPAIRS

1) In swing-out-cylinder designs, check with the cylinder closed and locked for side play. Excessive movement means the cylinder locking system is badly worn. Wear is likely to be in the frame and correction can be costly.

2) With hammer down and trigger held fully back, check for rotational play of cylinder at each chamber. Excessive play means laborious fitting of a new bolt and perhaps retiming will be needed.

3) Check at the front of the yoke or crane where it meets the frame. A significant gap between the two means wear in the cylinder locking system or that the crane is bent.

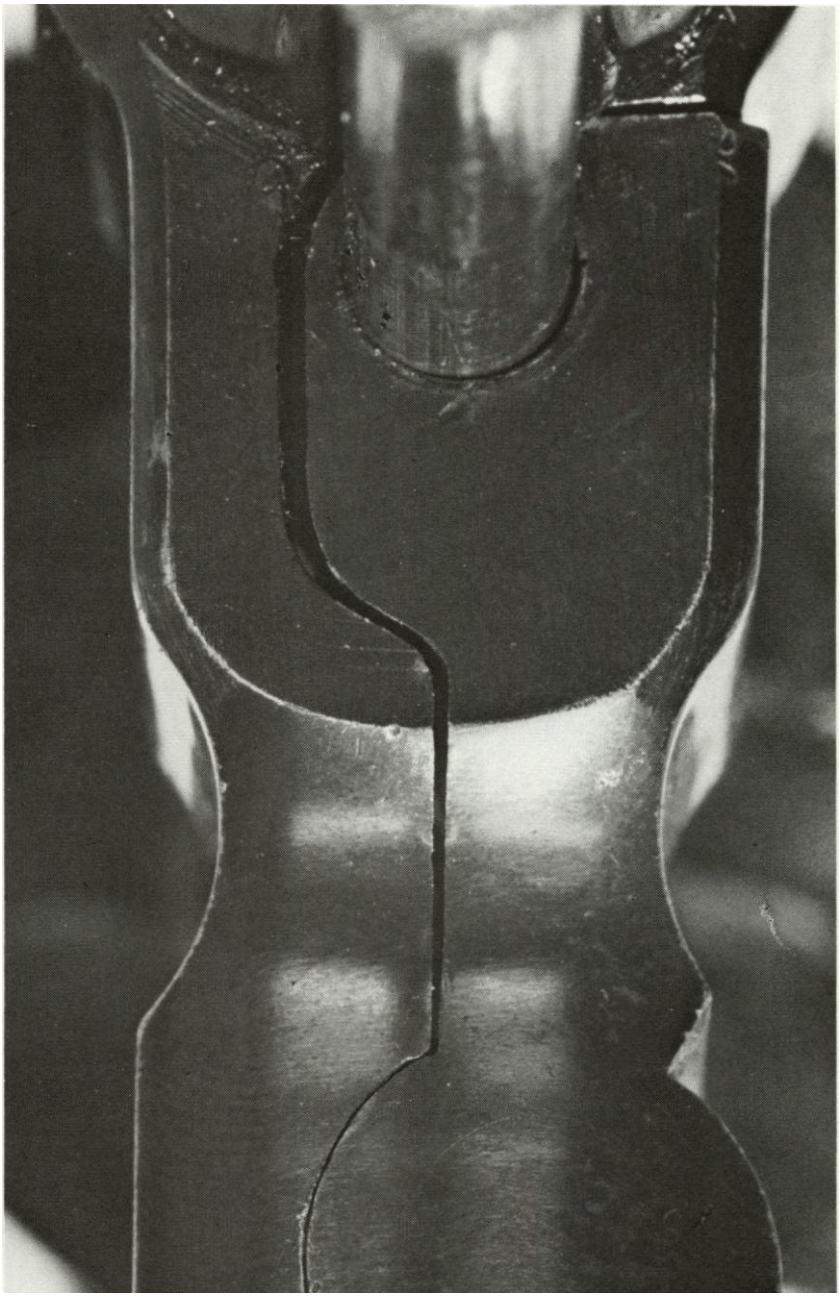
4) Place light drag on the cylinder, then slowly full-cock the hammer and note whether the bolt engages the cylinder. If it does not do so by the time full cock is reached, retiming is necessary. Then do the same thing double-action, making certain there is enough drag on the cylinder so that its momentum doesn't carry it past the point reached when the hammer falls. Failure of the bolt to engage during this test means the timing is really bad and may require several new parts.

5) Spin the cylinder on the open crane. Tight spots probably mean the crane arm is bent or dented.

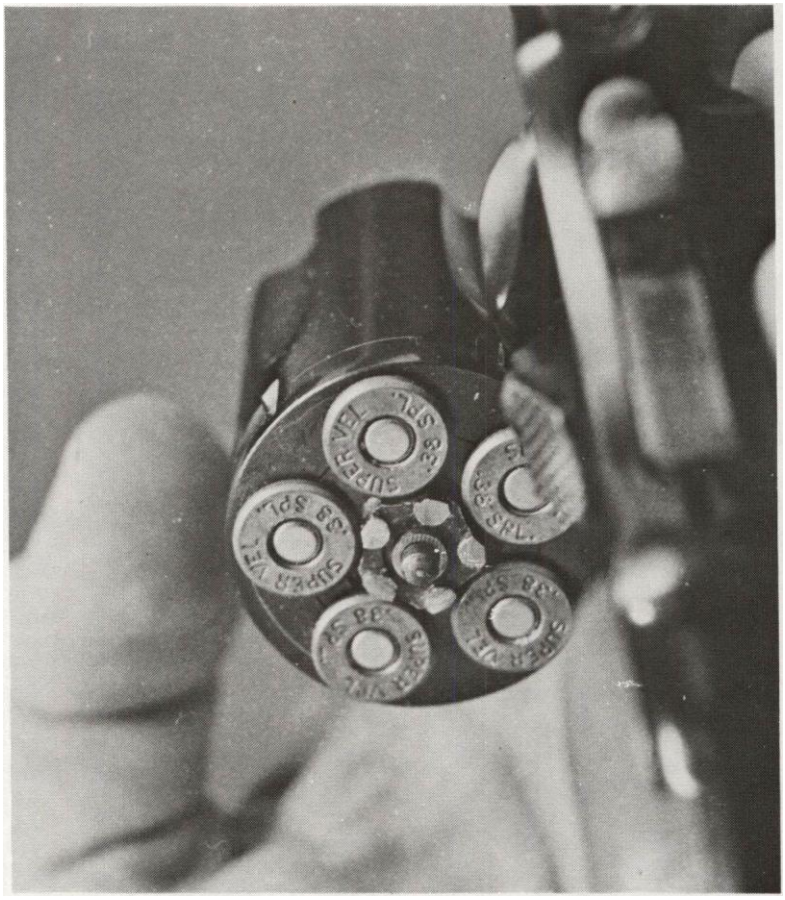
6) Push the extractor out all the way and twist its head to make certain it is not loose on its rod. Make certain also that the rod doesn't bind in the crane and that the extractor head seats fully in its recession in the cylinder.

7) Use feeler gauges and chambered cartridge cases to measure headspace. Insert feeler leaves between case heads and recoil shield. If more than about ·008-inch clearance exists, headspace should be corrected.

8) Then, with feeler gauge still between cases and recoil shield, check barrel/cylinder gap with feelers. A minimum gap of ·005-inch is needed for proper functioning, and anything over about ·010-inch means excess gas (thus velocity) will be lost when the gun is fired. Usually excess headspace and gap are corrected together and the job can become costly and extensive.



Check crane fit and alignment carefully; a gap like this when cylinder latch is engaged indicates bent frame or crane, probably from abusive slamming the cylinder closing in Hollywood style.



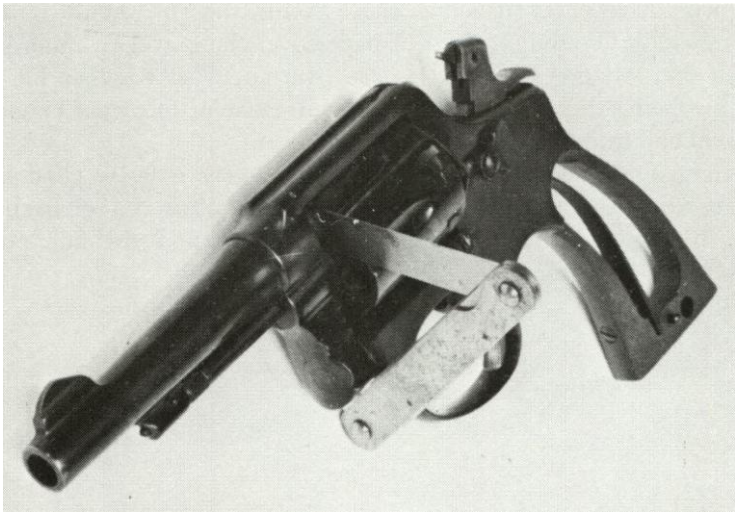
Make certain chambers are smoothly finished, unpitted, and will accept cartridges to their full depth.

9) Make certain the barrel is joined tightly to the frame.

10) Check the firing-pin bushing for tightness.

11) Check all moving parts for smoothness.

12) Remove the side plate and inspect all internal parts for rust, excess wear, or chipping and deformation.



In completely rehabilitating a worn gun, both headspace and barrel/cylinder gap should be regulated to minimum dimensions together, and this may require lengthening the gas ring and fitting a new barrel, since all four factors are closely interrelated.

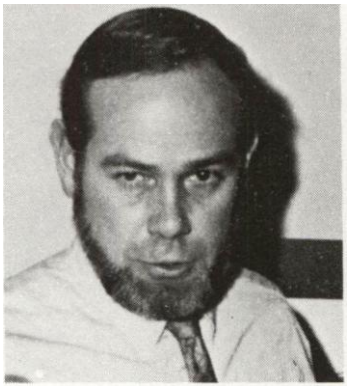
Once you've checked out all those points, the gun should be test fired if possible. Folding a sheet of paper over the barrel/cylinder gap will tell you whether gas loss is excessive, and also whether bits of bullet are being thrown out to the sides because of incorrect cylinder alignment and timing.

After you've decided that perhaps the gun is a fairly good buy and are ready to overhaul it, refer to the chapters on rebarreling, timing, headspacing, and the like. There you'll find the fine point details for whatever work must be done.

CHAPTER 21 - Tuning Autos for High Performance Loads

I've been reworking autos for twenty years to handle various factory and handloads that don't feed as well as the typical roundnose, full-jacketed round, common to all self-loading calibers. I've learned a lot in the process, but I've probably encountered fewer guns that needed work in all that time than a good friend of mine encounters in an average two-month period. He's President of Super Vel Cartridge Corp., and the designer of that company's entire line of high performance handgun ammunition. Since his biggest problem in gaining world-wide acceptance of high performance ammunition has been in obtaining the perfect feeding demanded for military and police use, and since he's been working on just that for over fifteen years, he's top man in the field as far as I'm concerned.

Consequently, I've asked Lee to set down his personal instructions and comments on the subject of making recalcitrant autos work with both handloaded and factory-loaded high performance cartridges. He's agreed to help, and the rest of this chapter came from his ballistics laboratory just outside Shelbyville, Indiana.



(Contributed by Lee E. Jurras)

Ten or fifteen years ago, even less, you could buy only one kind of ammunition for autoloading pistols—round nose, metal-jacketed bullets of one weight in each caliber, loaded to one standard velocity. All this usually produced excellent reliability in all manner of guns, but the bullets penetrated animal targets cleanly without expansion or deformation, and possessed less lethality for their size and velocity of all designs and types.

In short, unless of unusually large diameter, such as the ·45, they were lousy game or man stoppers. They still are, though now, about fifty years late, you have a choice. The selection is no longer so limited.

Of course, there have been a few exceptions to the rule. In recent years both lead and full-jacket semi-wadcutter bullets have been available in ·45 ACP caliber for target use, but loaded to minimum functional velocities which negate their more lethal profile. Also a few soft and hollow point loads had been offered by major manufacturers in 9mm and ·38 ACP and similar calibers. However, they were ineffective, producing ball-like performance because of poor design and inadequate velocity. Though of expanding design, they simply wouldn't expand under normal circumstances.

Consequently, all autos (except for special ·38 Special target guns, with which we aren't concerned here) were designed and manufactured purely for round-nose ball ammunition. With it, they achieved wonders of accuracy and functional reliability. But, they won't ordinarily give the same results with high performance loads.

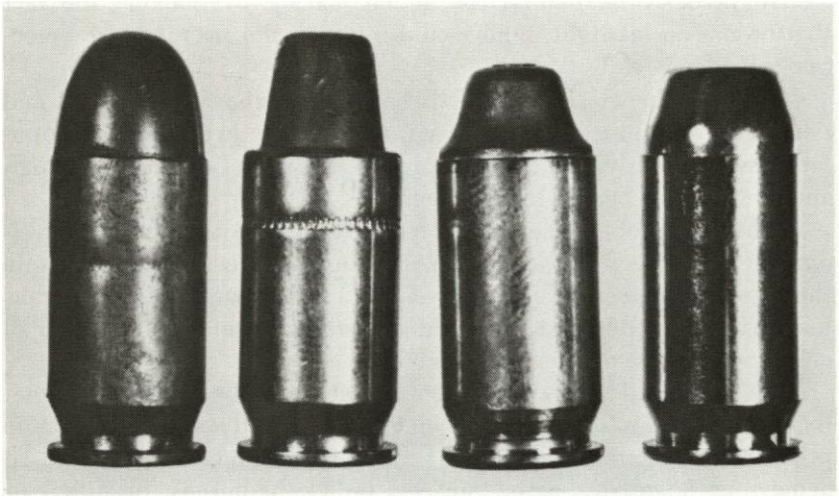
In the late 1950's and early '60's, I finalized the design principles of the expanding handgun bullets known since by the Super Vel label and their black and yellow boxes—but they are better known for their use in our Super Vel high performance loaded ammunition for both autos and revolvers.

In developing the bullets and ammunition, we were forced to consider carefully all the existing popular guns and calibers, both obsolete and modern. We had to produce designs that would function well in as many guns as possible, yet, if we'd insisted on perfect functioning in all guns, we would have ended up with that same old round nose full-jacket bullet.

We took the middle ground and compromised on the best expanding bullet that would function in the most makes and models of autoloaders in first-class condition.

That means simply that a very few guns won't handle our ammunition (and other makes of similar types) at all well. Some handle it perfectly without help; and in the middle are those that handle it fairly well but need a little help for best results.

Those in the last group are the guns I'll talk about next. Those designs and individual guns which need some tuning to handle high performance loads at full efficiency.



Most auto pistols were designed for the type of long full-jacketed round at far left (standard ball ·45 ACP); cartridges at right show variety of shapes and lengths encountered in high performance loads.

Let me make one thing clear, though—these tuning operations apply to all high performance auto ammunition, not just Super Vel. Though we were first in the field, and pioneered high performance handgun ammunition, all major manufacturers now offer similar loadings. Without exception, they suffer the same problems in many guns. I regularly run extensive tests on every new factory load that comes out, and fire 100,000 to 200,000 rounds of handgun ammo per year in the process. I don't think there is an ammunition/gun malfunction possible that I haven't encountered and corrected in one way or another. My concern here isn't to publicize our ammunition, but to help handgunners everywhere obtain maximum efficiency with any high performance cartridges, whatever make, whether handload or factory.

Not that all complaints are justifiable—or even believable, as is clear in correspondence I've received. One shooter (?) complained that none of his ·38 Super and ·45 Autos would handle the new Super Vel ammunition, and went into the great difficulties he had encountered. Unfortunately, the ammunition he complained about had not yet been sold commercially, so he could not have seen it, much less fired it. Similar handloads, perhaps, but not the genuine factory product whose publicity had come only from experimental lots shot at the plant and reported on by various writers. But, functioning problems did—and do—exist with the new loads.

A shooter may have had no trouble whatsoever with ball ammunition in his guns. Then, one day he buys a box of the new high performance loads and encounters feeding problems.

Righteously he blames the ammo maker—overlooking the fact that no one in his right mind would intentionally manufacture defective cartridges.

These high performance loads have been exhaustively tested and developed to produce optimum feeding reliability in all modern, popular guns. Obviously, this is the approach that must be taken if enough ammunition is to be sold to make a profit.

The real problem lies in the simple fact that ammunition development has moved ahead of gun development. In order to generate their greatly increased lethality, velocity, and expansion, high performance loads are different. Different from the ammunition for which all current guns were originally designed.

To obtain adequate expansion, bullets must be driven at higher than traditional velocities; to achieve this velocity within allowable pressure limits, bullet weight and bearing surface must be reduced. To achieve an adequate bearing surface, bullet shape must be different; and to secure adequate bullet pull, bullets must be seated to produce shorter overall length. With all the above in mind, the bullet/propellant combination arrived at must still offer a recoil impulse comparable to that for which the gun was originally designed.

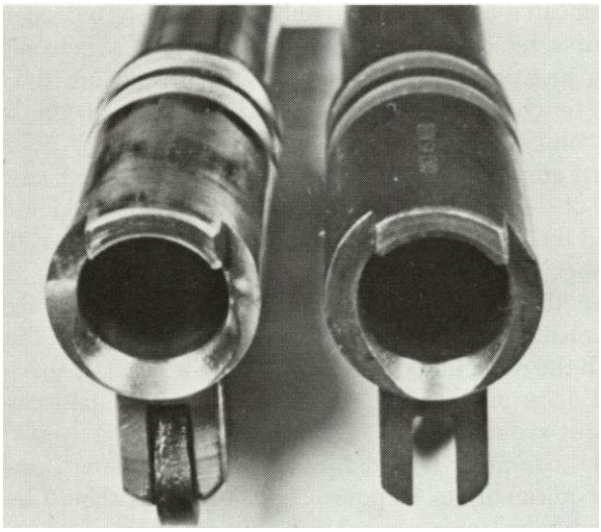
It is these differences in shape and dimensions of the loaded cartridge that causes what problems exist when the round is combined with a magazine and feed ramp originally made for ball ammunition.

Those difficulties usually occur in guns which contain deviations from standard in finish and shape of feed ramp and chamber mouth, or in magazine feed lips and follower.

Some designs and calibers are more likely to cause difficulty than others. Generally, those guns with two-piece feed ramps and/or unusually long travel from magazine to chamber are most likely to give trouble.

Feed ramps first. The older Browning-type feed ramp found in the Colt Government Model series is formed partly by the frame and partly on the barrel. When the barrel is in counter-battery (rearward) position, the two parts of the ramp should be aligned to form a smooth, continuous surface—but most are not and present a ridge which deflects or catches and holds the incoming bullet, preventing it from entering the chamber properly.

To insure feeding with short, truncated-cone bullets, or bullets with exposed lead, all semblance of a ridge must be ground or filed off, and then the entire ramp must be polished smooth while maintaining its original shape and angle. I have had instances where an individual says at this point, "Hell, that's too much trouble, I'll just shoot hardball."



Typical Colt-style feed ramp of the Government Model pistol, shown on the right as it comes from the factory, and on the left as widened, polished, and with the chamber mouth radiused.

Well, for the stud who might stake his life on the performance of his gun/ammo combination, I'll just say good luck. The feed-ramp job is a must for any auto doing personal defense duty, even if only ball ammo is to be used.

Usually, the ramp is of U-shaped cross-section and this must be retained. In some instances, cleaning up the ramp deepens the U. When that happens, it must be widened or the bullet nose will simply wedge into the too-narrow mouth of the U rather than slip smoothly through it. This is especially true of flat-nosed or truncated-cone bullets. This is likely to occur in reworking the old-style humped S&W M39 ramp.

There is one reasonably prominent ·380 import which I feel has a definite design error from the standpoint of reliable feeding, the Turkish copy of the Walther PP.

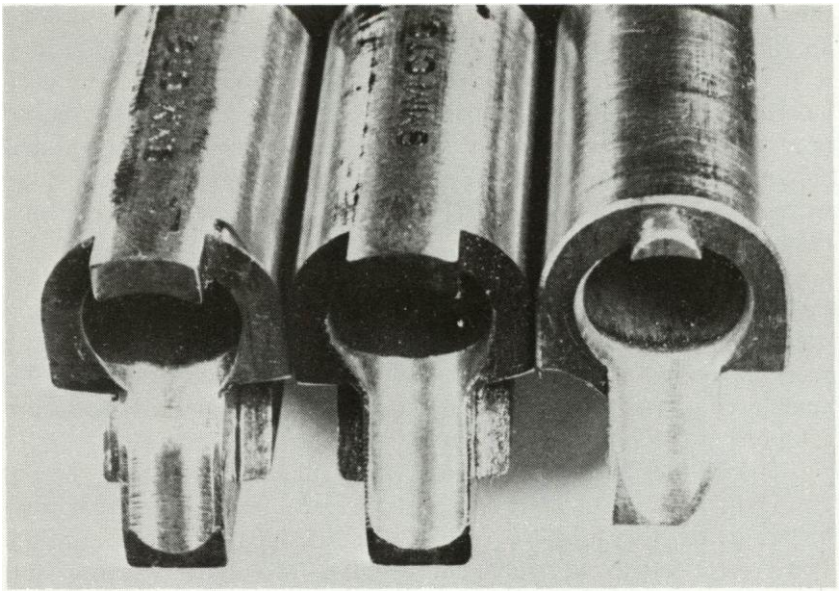
The feed ramp is cut in the forward portion of the frame but does not extend down far enough. It is not cut deep enough to allow a cartridge which comes straight forward from the magazine lips to be deflected upward toward the chamber. During initial tests of this gun, I experienced two failures to feed with standard ball ammo and five with the truncated-cone bullets in only 250 rounds. To deepen the feed ramp requires removal of a good bit of metal, a gunsmithing job, rather than just polishing the ramp. When deepening the ramp, its angle must be changed to form a smooth transition to the barrel portion of the ramp.

A sharp edge is often found where the feed ramp cuts into the lower edge of the chamber. This edge should be radiused and polished smooth, and this should be repeated at the front of the bevel found on some chamber mouths.

Further, the sharp mouth of the chamber should be lightly radiused and polished smooth. Carry this completely around the chamber mouth, with the exception of the barrel tang or hood. A sharp chamber mouth will occasionally snag the mouths of uncrimped cases, and a smooth radius avoids this.

Straight, one-piece feed ramps, such as that of the Browning HP, generally require only to be polished smooth. This should be followed by the chamber treatments just described.

Smith & Wesson M39 pistols numbered below about #150,000 have a one-piece feed ramp with a hump in its upper third. This hump causes feeding malfunctions and must be ground or filed away to form a straight surface, taking care to keep the channel wide enough. Current production M39s have a straight ramp, eliminating this problem. A new barrel with the improved feed ramp isn't expensive, so you might consider replacement, especially if the original barrel has been heavily used.



Three different one-piece feed ramps that will be encountered; left to right, old Model S&W M39; new M39; Browning High-Power. Note that chamber mouth of center barrel has been chamfered lightly, while the Browning chamber has been fairly heavily radiused to prevent uncrimped case mouths from snagging on a sharp chamber mouth. Note also on Browning where the sharp edge (clearly visible on the center barrel) formed by the ramp breaking into the chamber has been smoothly radiused.

Some guns will occasionally cause the nose of a bullet to snag on the sharp lower rear edge of the barrel tang or hood. This is more common in ·45 caliber than others. While this is caused partly by a less than perfect feed ramp, beveling or radiusing the lower tang edge* will help eliminate the problem by causing the bullet to bounce free rather than be caught and held on a sharp ridge. Don't overdo this, though, because ample tang/slide bearing is essential to proper lockup.

* Except in a Colt ·38 Super where it would destroy the headspacing shoulder.

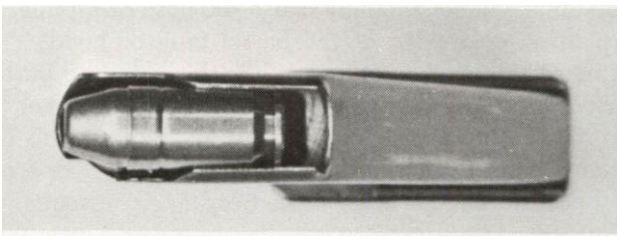
Some blowback pistols have what appears to be a one-piece feed ramp, but which is actually formed partly in the frame and partly in the barrel. The two parts are cut separately, then the barrel is screwed in place, and in theory the two parts align perfectly. Often, though, they lack a few thousandths of an inch of meeting perfectly, forming an almost imperceptible and very sharp ridge. Though hardly visible, it is enough to bite into not only soft-point type bullets, but even jacketed types, and cause a malfunction. Simply polishing the entire ramp smooth will remove the sharp edge, even if you don't see it, and eliminate feeding problems. If especially pronounced, this sort of ridge will prevent feeding even with ball ammo—I've seen several such examples.

Two designs, specifically the Luger or Parabellum and the Walther P-38 in 9mm caliber combine a very short feed ramp and long travel from magazine to chamber. This makes feeding of unusually short cartridges, such as the Super Vel 90 grain JHP very difficult. No amount of gunsmithing will compensate for this sufficiently to insure 100 percent feeding reliability.

Should you have one of these guns which will not feed the 90- grain Super Vel or similar short-cartridge loads, forget trying to correct it; just switch to a longer cartridge, such as the 112-grain Super Vel. The greater length will solve the problem, providing the ramp and chamber refinements mentioned earlier have been accomplished.

Alternatively, the magazine can be modified to hold the cartridge fully forward to reduce feed travel and improve feeding. This is done by installing a thin spacer against the inside of the rear magazine wall. It should be as thick as the cartridge involved will allow and still permit free passage of cartridges through the magazine body.

This spacer can be of any material, but aluminum is light, won't rust, and is easy to file to shape. In some guns, the follower and magazine spring will hold it in place, though it will rattle, but it's a better idea to epoxy it solidly to the rear wall. It can still be removed later if you want to use full length cartridges; just apply gentle heat to break the epoxy bond.



When shorter-than-standard, high performance cartridges are to be used in an auto, a spacer fitted inside the rear of the magazine box will improve feeding reliability. This example is made of wood and installed only temporarily to determine the optimum thickness for use with the Super Vel 90 grain JHP 9mm load in the S&W M39.

If the spacer is more than a few thousandths of an inch thick, the rear of the follower must be cut forward to make room for it. On solid followers, just file or grind off the appropriate amount, taking care to maintain the original rear angle. On simple stamped followers, such as the P-38's, cut a section out of the middle of the upper portion, then silver-solder the parts together, preferably with a reinforcing strip on the underside.

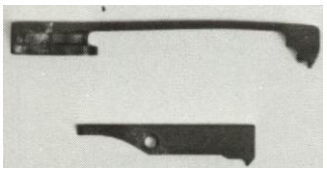
Other areas of the gun may cause no trouble with ball ammunition, but combined with marginal functioning they will cause occasional problems with high performance loads.

If you have slightly deformed or worn magazine lips, try a new magazine with the sharp edges of the feed Ups polished and radiused, and the follower polished smooth. Also make certain the magazine spring is installed correctly; backwards it may feed ball okay, but foul up with high performance loads. It's more common than you think for a spring to be found backward.

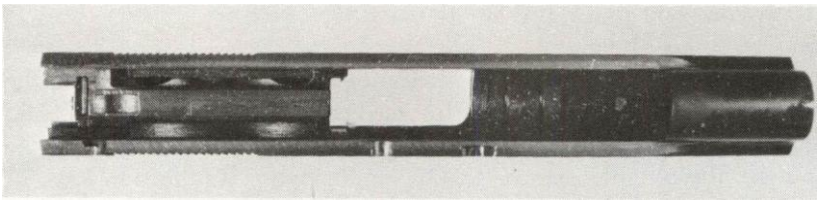
If the breech face in the slide, or the extractor claw, is rough or burred, the case head may not be able to rise smoothly into position from the magazine. Burrs around the firing-pin hole will have the same effect.

All are easily removed with needle files and/or small stones. The breech face should be uniformly flat and smooth, but need not be highly polished. Also, slightly bevel the lower edge of the extractor body right behind the claw, so it doesn't bite into the rim as the case slides up under it.

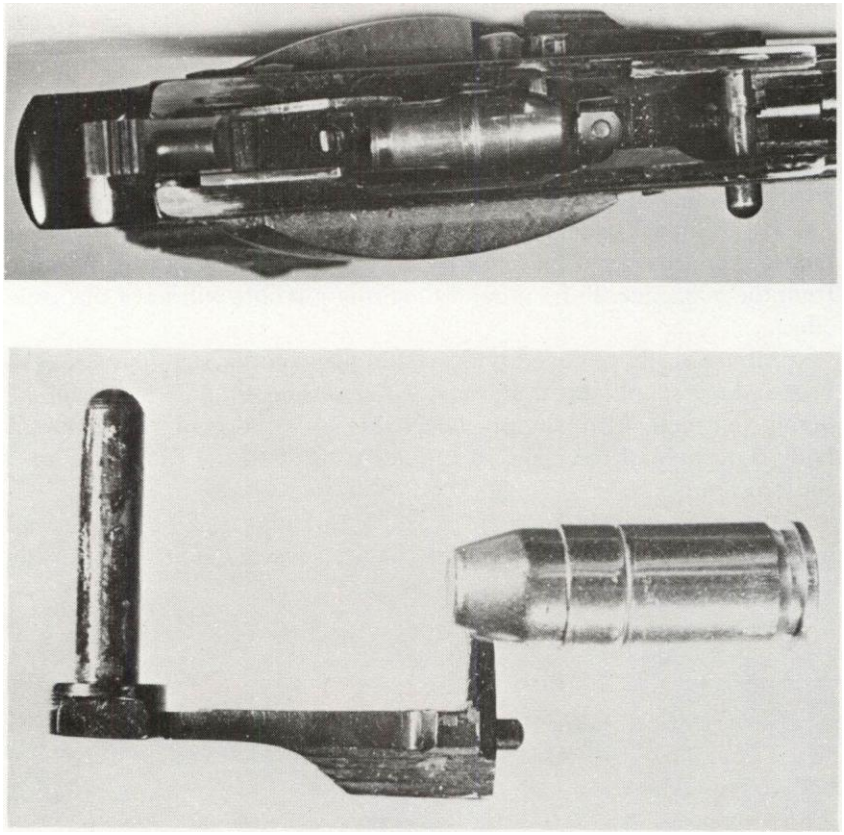
When all is right in these areas, a cartridge can be pressed up under the extractor by moderate finger pressure, without causing scratches or gouges on the case.



Regardless of style or design, autoloader extractors have relatively small engaging surfaces which draw the fired case from the chamber; these surfaces must be clean and sharp, yet free from burrs or sharp edges that can dig into the case rim as it feeds.



Underside of slide should be polished glass-smooth in all areas to reduce friction and make more energy available for feeding; underside of extractor claw should be lightly beveled or radiused to allow free movement of cartridge up under it.



(Above): In this particular gun (M39 S&W) the bullet of a loaded cartridge comes into contact with the inward protrusion of the slide stop and may be prevented from feeding, or, may elevate the slide stop to lock the gun open. (Below): The portion of the slide stop which contacts—even slightly—the nose of the cartridge as it rises into the magazine feed lips must be cut back, but cautiously, to retain adequate engagement with the magazine follower which activates the stop.

Guideways and ribs on both frame and slide should fit snugly, but be as smooth and friction-free as possible to make maximum energy available for feeding.

Good feeding with high performance loads requires a full- strength recoil spring. The spring has little to do with resisting recoil, but provides all the power for feeding. A weak spring means weak feeding, and that makes failures more likely, even if all else is right.

In addition to all this, all the friction-reducing tuning normally performed on accurized guns will add that slight extra edge of reliability by making recoil and counter-recoil smoother, and by making more energy available for stripping cartridges from magazine to chamber. Areas to be smoothed are hammer/slide, slide/disconnector, ejector slot, slide tracks in receiver, etc. I see this is well covered elsewhere, so I won't go into it here. Just remember that friction is the enemy of good feeding with any ammunition.

Guns based on the Colt Government Model will also benefit from installation of a recoil buffer of the type made by Dinan and Custom Gun shop. This unit not only reduces slide impact, but gives an extra flip to the slide as it starts forward and makes more energy available for feeding.

No such device is available for other designs, though I suppose one could be built by a good machinist for a few bucks.

That generally takes care of the functional aspect of adapting your autos to high performance ammunition.

However, there is still the problem of sights. Most autos carry only fixed service sights regulated for the standard ball round at 25 yards. High performance, light-bullet loads will print well below that point, as much as a full foot in some guns. Theoretically, filing down the front sight will bring things together, but most sights won't be high enough for use after that, and they certainly won't be any good later for ball ammo.

So, you'll need either a higher fixed rear sight, or a fully adjustable rear sight. Very good for the latter is the MMC combat sight, which fits many guns without alteration and without need for a new front sight.

All things considered, any modern auto can be fully as reliable and a damned sight more effective with high performance ammunition as with ball. It's simply a matter of the right gun paired with the right load and sights—and proper application of all the little tuning operations discussed here.

So, have at it.

L. E. Jurras, Pres.
SUPER VEL CARTRIDGE CORP.
Shelbyville, Indiana

CHAPTER 22 - Autoloading Pistol Magazines

At least 90 percent of all autoloading pistols' malfunctions may be traced to their magazines. Flawless functioning is absolutely dependent upon the magazine, and two principal designs will be encountered: First and most common is the "single-column, single-position feed", and second is the "double-column, single-position feed". A third type exists, but is not found in any modern guns; it is the "double-column, double-position feed" design, usually encountered only in submachine guns.

The single-column, single-position feed consists of a sheet metal box. Its section is roughly the shape of the cartridge it is to handle and its dimensions slightly greater than the cartridge. Internally, the column of cartridges is pressed upwards against the feed lips by a follower. Pressure is provided by a follower spring, which is attached to either a fixed or removable magazine floor plate. To function properly, the spring and the follower must move freely, without undue friction through the body.

The spring must have sufficient force to hold the full column of cartridges against the underside of the feed lips at all times, particularly during recoil. For example, if recoil forces push the cartridges downward in the magazine, then the top cartridge may not be stripped from the magazine and chambered properly by the slide or bolt. Yet the spring must not be so powerful that it holds the cartridges too tightly against the feed lips. Excessive spring force will cause the top cartridge to bear too heavily against the slide or bolt, creating excessive friction that slows slide travel and may cause a short-recoil malfunction.

Thus, the magazine spring must be strong enough to hold the cartridges in position at all times, but not so strong that it creates excessive friction. The follower must hold the cartridges at the proper angle for feeding, but without producing excessive friction when the last cartridge is stripped.

FEEDING MALFUNCTIONS AND CORRECTIONS

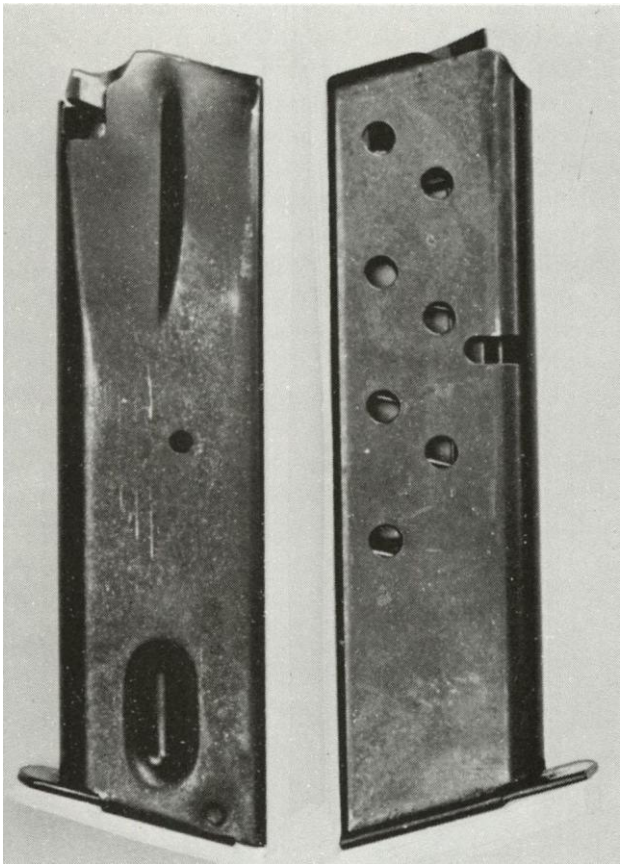
Feed lips are most likely to cause difficulties. If they are dented or bent, cartridges will not be held at the proper angle to be stripped and chambered. If feed lips are nicked or burred, this may dig into cartridge cases, causing undue friction which also prevents proper feeding. If severely bent, the lips may prevent the top cartridge from being caught by the slide or bolt at all, or may cause it to be stripped at an incorrect angle.

Double-column, single-position feed magazines must meet all of the foregoing requirements to function well, and since their two columns of cartridges must be merged into one at the feed lips, much more friction is developed, requiring a heavier spring and sturdier lips.

Let's take a quick look at typical magazine feeding malfunctions and how they may be corrected.

When the feed lips are spread too far apart at their forward edges, the cartridge nose will rise too high, resulting in a "cocked" round caught vertically between slide and breech. This may be corrected by squeezing the feed lips closer together at their front. In a well-worn magazine, the lips may be too weak to stay in the proper position and the magazine must be discarded.

This fault may also be caused by incorrect follower angle; that is, the front of the follower may be too high in relation to its rear, positioning the cartridge at too sharp an angle for proper feeding. This usually occurs only with sheet metal followers found in Colt/Browning designs and may be corrected by bending the follower to the proper angle.



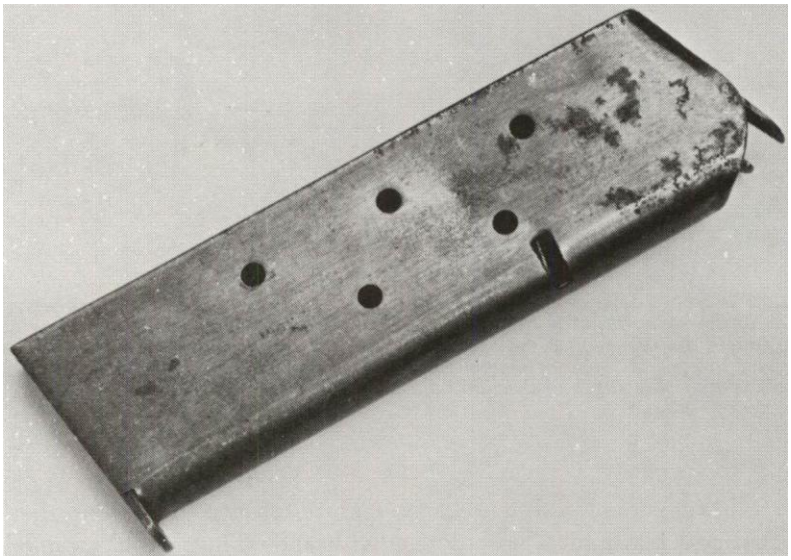
Left is S&W double-column magazine and right is single-column magazine for use in the same basic design. Note double-column box has depressed areas at top to funnel the two rows of cartridges into single feed Ups, and also depressions at bottom to control follower movement. Feed lips of this box have sharp edges whereas comparable edges of the other magazine are smoothly radiused.

When the front of the feed lips are squeezed too close together, or if the follower is bent with its rear too high in relation to its front, then the cartridge is jammed nose-down, with the bullet point rammed against the feed ramp. Corrections should be obvious.

When the top cartridge fails to rise high enough to be stripped from the magazine, feed lips may be deeply dented or, more likely, dents in the body are binding the follower. Dents in the magazine body, if not too severe, may be corrected by disassembling the magazine and filing away the inward protrusions. If the dents interfere only with the follower movement and not the cartridge movement, it may be simpler to file the follower's sides until it moves freely. If the dents are more severe and will not even allow the cartridges to pass through the magazine body, then they can sometimes be removed by drilling or cutting them out of the magazine body.

Alternatively, a steel mandrel may be shaped to fit closely inside the magazine body, allowing the dents to be hammered sharply from the outside and flattened out. Sometimes this works and sometimes it doesn't; often the amount of hammering distorts and enlarges the magazine so that it will not enter the gun freely.

Dented, kinked, or broken springs will fail to elevate cartridges properly, particularly the last three or four rounds in the column. If in otherwise good condition, bent or kinked springs can be straightened by careful manipulation of two pairs of pliers on either side of the bend.



Between the second and third holes from the top can be seen a small, almost imperceptible dent in the sidewall of this ·45 Colt magazine. It is just deep enough to interfere with free movement of cartridges, and may be repaired by drilling it out, or by filing off the protrusion it causes inside the body.

When the spring is too weak or perhaps too short to elevate all cartridges properly, it may often be temporarily restored to proper functioning by stretching it. Alternatively, correct functioning with such a spring may sometimes be obtained by loading the magazine with one, two, or three fewer cartridges.

Occasionally, particularly with Colt/Browning and Luger magazines, feed lips will separate from the rear wall of the magazine body. When this occurs, correct feeding becomes impossible with a full charge of cartridges because the increased pressure against the lips spreads them at their rear. Correct feeding can be obtained by loading the magazine about half full, and a permanent repair can sometimes be made by brazing or silver-soldering (or even welding) the cracks. However, such magazines should be discarded, since such repair is uncertain.

When magazine lips are badly distorted, it is often difficult to reshape them unless an undamaged magazine is available to use as a pattern.

While most magazine repairs are usually possible, you should keep a spare magazine or two for each pistol. Often magazines that appear to have been correctly repaired simply will not produce 100 percent feeding reliability and should be discarded.

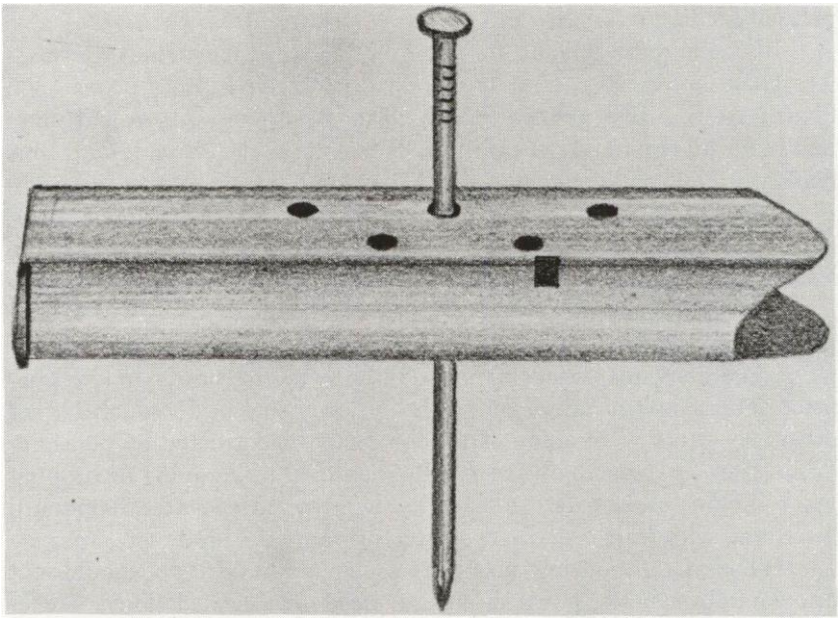
It's often quite difficult to obtain replacement magazines for obsolete guns, however, at least one company, Triple K Enterprises (568 Sixth Ave., San Diego, Calif. 92101), produces new replacement magazines for all commonly encountered obsolete models. In addition, this company will make magazines to fit any gun. In many instances, replacement magazines are manufactured exactly as the original; however, in some models different design and construction are used for the sake of economy and convenience. While some Triple K magazines are less desirable than the originals, they are generally acceptable and produce proper feeding.

Sometimes, magazines fit too tightly in their recesses in the gun, usually the result of minor bulges in the magazine body which do not otherwise affect functioning. They can easily be corrected by polishing or filing the bulges, which are usually identified by scraping or rubbing marks. If no marks exist, smoke the magazine in a candle flame and insert and withdraw it to discover exactly where the binding occurs.

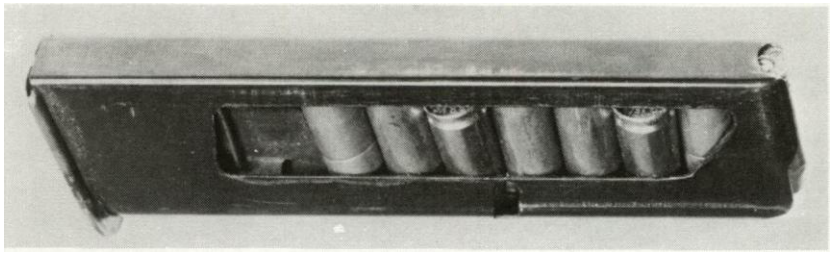
When a tight fitting magazine is encountered, you should not immediately assume, however, that it needs to be filed down. Sometimes grip screws protrude inside the magazine well and cause binding. Burrs inside the magazine well also cause the same problem, as can bent internal parts—for example, the trigger stirrup of the Colt/Browning design sometimes binds on the magazine. These areas should be checked first.

Another problem, particularly with those magazines constructed of very thin metal, is excessive distortion of magazine-catch notches. When a magazine is worn at its catch notch, it slips downward in its well and may not elevate the cartridges high enough to be stripped properly. Such magazines are best replaced, however, they can be repaired by very careful welding up of the worn surface and then filing it to fit. Ideally, the surface should be raised so that when the magazine is pressed fully into position the catch will just barely engage-

The types most likely to wear excessively are those that use the Browning-style catch which engages a notch high up in the body. Those least likely to produce this difficulty have a large catch which engages the floorplate at the butt.



Most magazines contain holes in both sides to allow cartridges to be seen. These holes may also be used to hold the follower and spring in a compressed position to provide clearance for working on feed lips without complete disassembly.



When cutting out magazine sidewalls, care must be taken not to extend the opening too far rearward; as shown here, short, high performance cartridges may bounce forward under recoil and then jam against the rear edge of the cutout.

Modern autoloading pistols use detachable magazines, but some older designs contain integral magazines which are loaded through the action by using a charger or by inserting single cartridges. Common among these is the Steyr M12 with its single-column, single-position-feed magazine and its spring-loaded feed lips. Feed lips in this gun are very seldom damaged, but are easily repaired by careful welding if they become excessively worn.

The other and probably more common example is the famed broomhandle Mauser pistol with its double-column, double-position- feed fixed magazine. Its feed lips are machined integrally in the underside of its barrel extension and seldom, if ever, offer any problems. But they, too, can be welded up and reshaped if serious difficulties are encountered.

CHAPTER 23 - Autoloading Pistols—Combat Conversions and Customizing

In recent years, professional users of big-bore autoloading pistols have become dissatisfied with the standard products of the major manufacturers. The venerable Colt ·45 M1911 auto, long the principal choice among fast-firers, was finally recognized to be far heavier and bulkier than was really necessary. Pistoleros wanted the power and characteristics of the big Colt/Browning design but did not wish to carry around its two and one-half pounds and generous dimensions.

Quite likely the initial emphasis was given to this line of thought when Colt introduced its lightweight, aluminum-frame version of the M1911 in 1947 and gave it the name “Colt Commander”. Users of the new gun, which met with immediate acceptance, suddenly realized that it was possible to have all the advantages of the big ·45 in a much smaller and lighter package.

While I can’t prove it, I believe that the subsequent developments in so-called “combat conversions” of not only the Colt but other designs stem from the introduction of the Commander. Various pistolsmiths—amateur and professional alike—realized that if Colt could cut three-quarters of an inch and three-quarters of a pound off the M1911 that there was quite likely still further room for paring the big gun down.

In the beginning, the 'smiths contented themselves with merely shortening the slide and barrel of issue ·45 pistols to achieve the dimensions of the new Commander, though not its light weight, and thus gained compactness without buying a new gun. In reality, Colt forced this development by refusing to sell Commander barrels and slides as replacement parts. Many a ·45 aficionado stormed and raged at his Colt dealer because the shortened barrel/slide assembly could not be purchased. Many of them, feeling that Colt was taking unfair advantage of them, had issue guns chopped and shortened rather than buy the new model.

Then, again, the wheel turned, and by 1972 Colt had become so impressed by the shortened issue guns that it produced its own version called the "Combat Commander" or "Steel-framed Commander." This was nothing more or less than the Commander slide and barrel installed upon a very slightly modified steel Government Model frame.

So, where Colt's introduction of the lightweight Commander originally forced pistolsmiths into shortening the big gun, that action eventually forced Colt into producing the Combat Commander. And, it appears fairly obvious that the word "Combat" was copied in the new model name from the by-then popular "Combat Conversion" term applied to the shortened issue, 45s.

While the Commander serves as a model, 'smiths, however, did not view it as a goal, but rather as simply a stage in development of the smallest and most compact ·45 auto possible. While quite a number of 'smiths dabbled in the game, Armand Swenson appears to have carried the idea farther than most, and was followed more recently by Austin Behlert of The Custom Gunshop in Cranford, New Jersey. This scribe was also active in the field, and my first sawed-off ·45 auto dates from the early 1960s. That first gun was not made up because I felt my ideas were any better than the others, but simply because I couldn't afford the $200 plus price of having one of my issue guns converted by a professional.

At the present time, the ·45 auto in any of the three variations mentioned above is shortened to as little as seven inches overall, with a 3⅝-inch barrel, and reduced in height as much as one full inch by various pistolsmiths. Further, it is fitted with various types of target or specialized combat sights, reduced in weight by lightening cuts and the substitution of aluminum-alloy parts for some made of steel, recontoured for ease of handling and concealment, and fitted with various accessories and modifications intended to make it handle better and more quickly in a pure combat situation. It is even modified to doubleaction by Louis Seecamp.

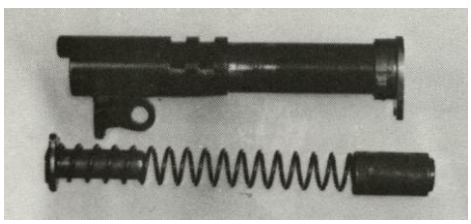
TYPICAL MODIFICATIONS AND ACCESSORIES

Listed below are the various modifications and accessories which are applied to the big ·45 in the name of Combat Conversion:

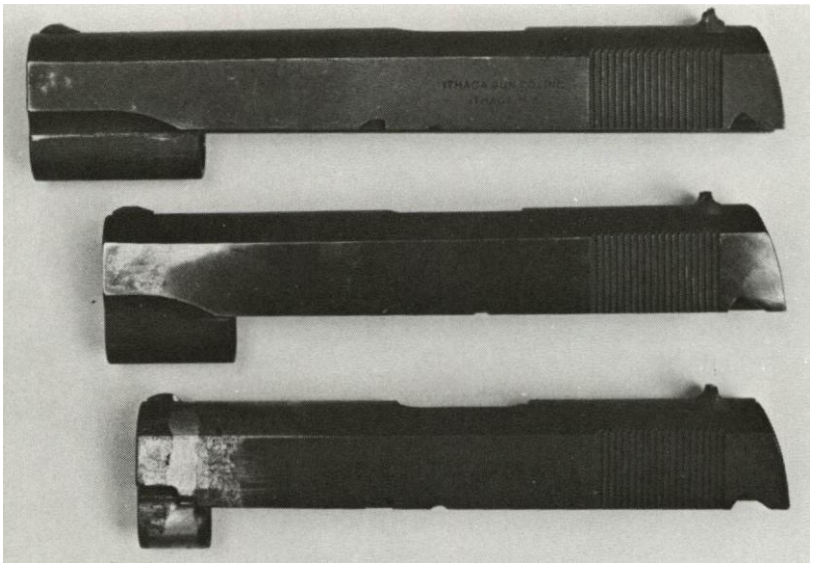
Shortening barrel and slide
Accurizing
Installing target or special sights
Reshaping hammer spur and grip safety
Reshaping trigger guard to form a forefinger rest for the off hand in two-hand shooting
Checkering or stippling front and/or backstrap
Installing speed-type thumb safety
Installing speed-type slide stop
Fitting special grips
Matting or checkering all "eyeward" surfaces to prevent glare
Adding soft magazine bases
Special throating and tuning to feed high performance ammunition
Special magazine followers to improve feeding
Removing excess metal to reduce weight
Special finishes to prevent corrosion
Conversion to double-action lockwork
Installation of thumb-operated cocking lever
Installation of squeeze-cocking system
Enlargement of trigger guard for gloved use
Replacement of frame with an independently manufactured, aluminum-alloy frame
Caliber conversions to ·38 Super, 9mm P., 7·65mm P., etc.

WORK PROCEDURES

Even the above list is probably not complete at this time, for there has never been any shortage of ideas on this subject. With that as background, anyway, let's run through the basic Combat Conversion procedures.



Full set of shortened barrel, bushing, recoil spring, guide, and plunger.

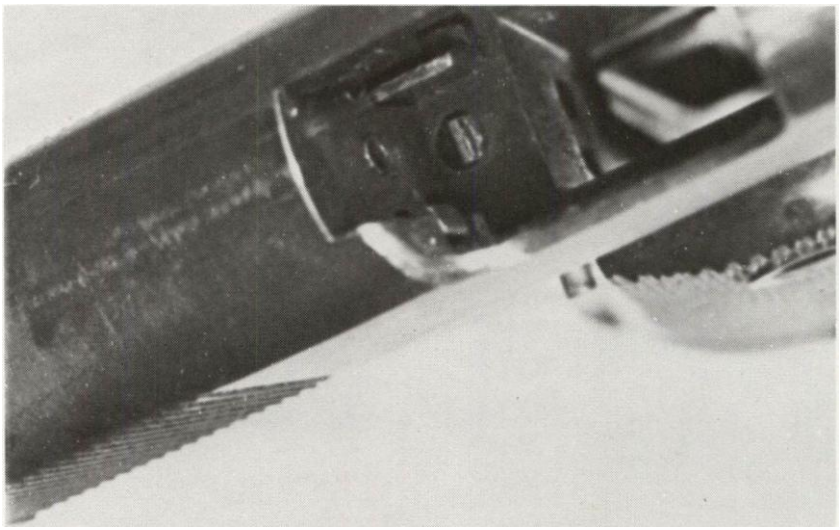


Top is standard GM slide, beneath is Colt Commander slide, showing additional spring tunnel length necessary. Bottom is a much shortened slide without tunnel extension but which will be functionable if an extension ring of the type used by Swenson is installed.

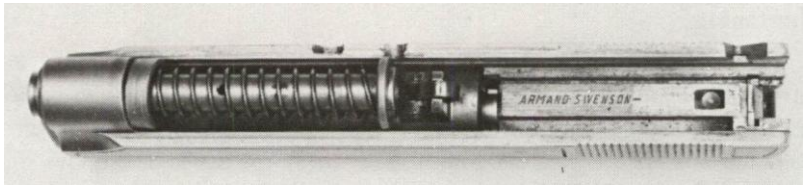
Shortening

This generally consists of sawing off one inch of the slide and barrel. Less may be removed if desired—and at some sacrifice in reliability, as much as an additional 1/2-inch may be removed. Regardless, the excess is cut away a bit forward of the point desired and the slide and barrel muzzle filed back flat, square, and true, exactly one inch shorter than their original length. The barrel muzzle is then carefully crowned and radiused and that unit set aside for the time being.

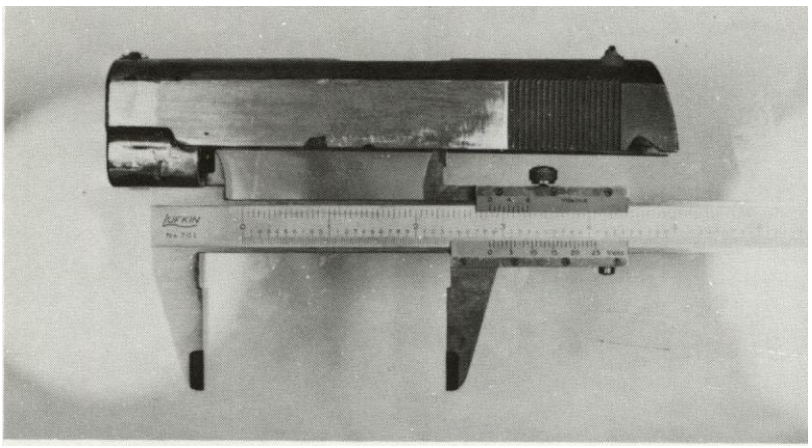
Shortening the slide reduces by a like amount the space available for the recoil spring, and a spring of sufficient length to function the gun properly cannot be made to fit into the remaining space. To increase spring space, a section of the spring tunnel is cut from the cutoff slide muzzle and carefully filed or ground until it may be properly aligned at the rear of the original recoil spring tunnel. It is then scarfed or beveled at all edges where it meets the slide, and carefully welded (preferably by heli-arc) in place. The welds must penetrate completely because this extension is subject to heavy impact loads. The recoil spring tunnel is then cleaned and trued up by running a 1/2-inch drill through to cut away the weld protrusions and any irregularities or misalignment.



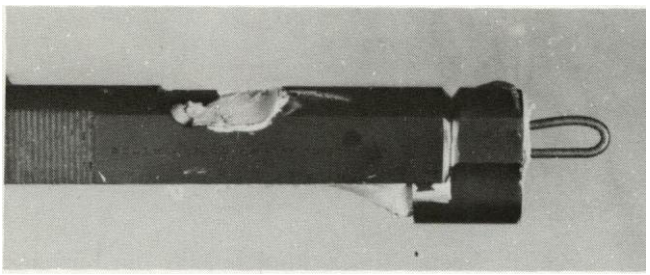
When extending the recoil spring tunnel rearward, it must not be moved so far that the slide face cannot travel back to at least the point of the disconnector.



Underside of this Swenson-shortened ·45 shows how a hardened steel ring, riding over the recoil spring, may be substituted for the welded spring tunnel extension.

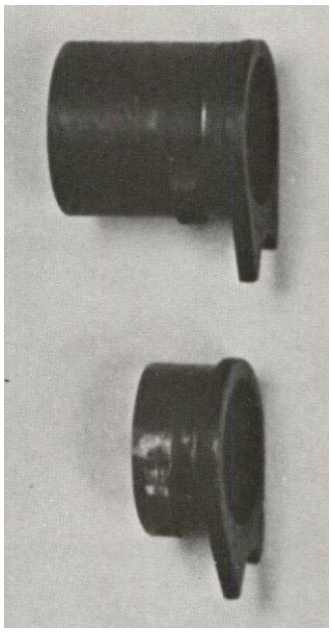


Checking distance from breech face to rear of spring tunnel to determine how much tunnel has been extended rearward.



An alternate method of shortening the slide and extending the spring tunnel simultaneously consists of cutting a L-shaped portion from the slide muzzle, shortening the balance of the slide, then welding the muzzle back in position.

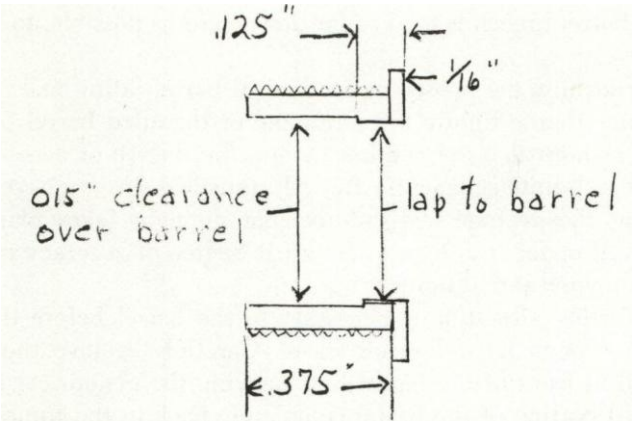
The rear face of this extension is next carefully squared up with files, and any weld intruding into the slide guide grooves must be removed. If the weld is done carefully, the latter won't be necessary. Fit of the slide on the frame next must be checked carefully to make certain that no warpage or other damage has occurred which will interfere with its full travel.



In any significant amount of shortening, the barrel bushing must also be shortened to avoid contacting the locking lugs.

At this point, a barrel bushing must be installed. The simplest method is to utilize the original bushing, taking the slide and bushing to a machinist, along with the cut-off muzzle, and having him duplicate the original cut which accepts the locking lug on the bushing. After this is done, the bushing is cut off and trued 1/16-inch behind the lug. Alternatively, if you have access to a screw-cutting lathe, a new bushing with a threaded body may be turned from tool steel as shown in the sketch. Then, the inside of the slide muzzle is threaded to match, and the new threaded bushing is carefully fitted so that it turns up tight in the proper position to engage the recoil spring plunger. In reality, the threaded bushing provides a much more secure and stable assembly than the shortened original bushing.

A third alternative barrel bushing setup consists of shortening the original bushing to a length of 3/8-inch and removing its retaining lug, then brazing or silver-soldering it into the slide muzzle in the firing position. This destroys the original disassembly method for the Colt/ Browning design and requires alteration of the slide and barrel to permit the barrel to be removed down and rearward after the fashion of the Browning HP and the S&W M39.



Turn threaded bushing from tool steel; thread slide muzzle to match.

The work is accomplished by first machining or filing identical vertical flats on both sides of the chamber portion of the barrel, reducing the barrel at that point to the maximum width that will allow the chamber portion to pass up between the sides of the slide at the ejection port. This dimension may vary a good bit, but on the gun I am currently using it is ·630-inch. Simply measure the inside of the slide at this point and then reduce the barrel width to about ·003-inch less.

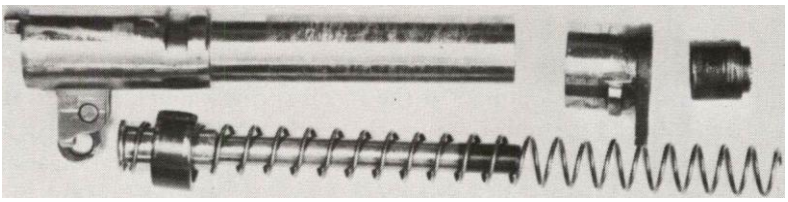
It is necessary to file or grind clearance at the lower inner edge of the barrel bushing and the upper rear edge of the recoil spring tunnel to allow the barrel to be inserted into the bushing from below and behind as shown. The angle of this slope is approximately 20 degrees from the top of the slide and, in the interest of neatness, it should be cut on a radius matching that of the underside of the barrel. Only the minimum amount of metal necessary to permit entry of the barrel should be removed.

Once the barrel has been altered as described and the clearance has been filed or ground, the barrel is assembled to the slide by inserting the muzzle above the rear of the recoil spring tunnel, forward into the barrel bushing, and then pushing simultaneously upward the chamber portion into the ejection port area. Some additional clearance may be required between bushing and barrel muzzle to prevent binding during the last stages of installation, and a short 60-degree bevel at the top rear edge of the barrel tang will also ease barrel installation. Personally, I fit the barrel snugly enough so that a light blow from a plastic hammer (on the barrel lug) is necessary to seat the barrel breech fully, and a similar blow is required on the muzzle of the barrel while the barrel breech is held as far downward as possible, to remove the barrel.

Theoretically, the preceding method of barrel fitting will produce less accuracy than a tightly fitted original or threaded barrel bushing. However, at normal pistol combat ranges, the degree of accuracy obtainable is still quite sufficient. After all, statistical surveys have shown clearly that the average law enforcement gunfight takes place at a range of well under twenty feet. No great degree of accuracy is necessary to hit anyone at that range.

One further alteration is necessary to the barrel before the slide can move through its full recoil travel. Carefully remove the downward swell in front of the barrel lug, carrying the cylindrical form of the forward portion of the barrel completely back to the front face of the forward locking lug. While this is most conveniently done by chucking the barrel in a lathe, I've encountered no difficulty in completing the job in less than ten minutes by careful filing, using a safe edge file, and then lightly polishing the cleaned up surface. Removal of metal in this area permits the shortened barrel bushing to travel all the way back on the barrel. If this metal is not removed, the bushing will encounter it and jam short of reaching its full rearward position.

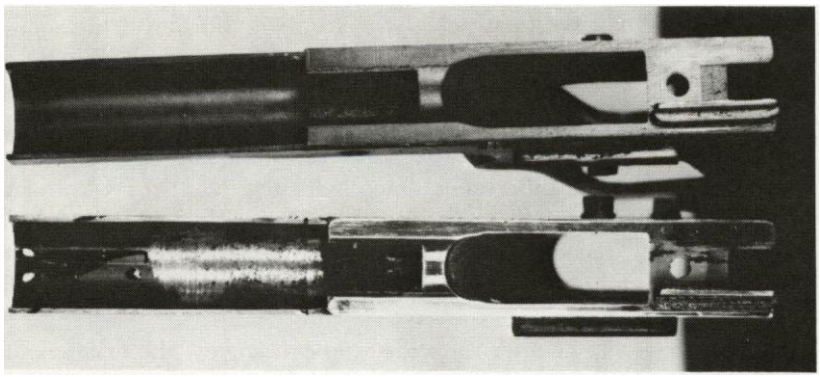
At this point assemble the barrel and slide to the frame (without recoil spring or its companion parts) and make certain all function freely.



These are the shortened components of a C&M Trading Company Combat Conversion of the Colt Government Model. Note recoil spring guide has been extended, the front locking lug has been removed, and a spacer ring is used around the recoil spring, rather than extend the spring tunnel rearward.

Next, cut off and true up the rear of the recoil spring plunger, so that it lacks about 3/32-inch from reaching the end of the spring tunnel. Cut off the front of the recoil spring guide one inch forward of its flange, exposing its hollow interior, and slightly bevel the inner edges of the hole. Take a piece of 3/16-inch drill rod and turn 1/2-inch of one end down to a diameter that will just barely enter the cut-off end of the recoil spring guide. Silver-solder or braze this drill rod extension firmly to the original recoil spring guide. Now, to finish the recoil spring guide, grind or file the portion which extends rearward of the flange down until it protrudes no more than 1/32-inch. Square up the cut face and lightly bevel the edges.

One additional alteration remains to be conducted on the frame. With the additional length added to the recoil spring tunnel, the slide can no longer move as far rearward on the frame as it did originally. Deepening the recess in the frame into which the flange of the recoil spring guide fits will allow the slide to move further rearward. The flange seats on this surface in the frame, and the slide in turn is halted by striking the flange. This surface must be moved rearward 1/8-inch, and this is most easily done in a heavy-duty drill press turning a ·650- inch end mill while the pistol frame is held securely in a vise or clamps on the press table. If doing this job yourself, take extreme care in aligning the frame as accurately as possible with the end mill. Then, measure carefully, and make the cut in several passes, measuring after each, to make certain you don't go too deep. Drill press quill stops aren't generally accurate enough to stop the cut precisely at the point needed.



Above, GM frame on bottom shows slide abutment has been cut back, while other frame is original.

After abutment is cut back, slide rails should be cut back a corresponding amount, and the front of the frame shortened, if desired.

After this, drill a 13/64-inch hole through the center of the cap of the recoil spring plunger. Assemble the barrel to the slide, then place the recoil spring plunger in place, locked by the bushing, and insert from below and the rear of the recoil spring guide, carrying the original recoil spring shortened to 21-22 coils.

Compress the recoil spring inside the plunger and make certain the guide enters the hole. Press the flange of the guide up against the barrel, just ahead of the barrel lug. If necessary to aid in holding the spring guide up against the barrel while the slide is slipped onto the frame, file a small, vertical flat at the front of the barrel lug against which the flange may rest. Trim the recoil spring guide flush with the front of the slide.

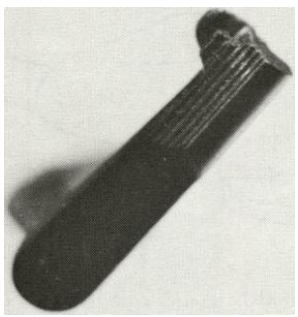
Slide this entire slide/barrel unit on the receiver and secure in the usual manner with the slide stop. Draw the slide fully to the rear and observe whether the slide breech face halts at a point rearward of the peak of the disconnector. If it does not, disassemble and file forward the face of the recoil spring tunnel until it does. Smoke rear of the spring tunnel and check to make certain it is making full contact with the spring guide flange.

Now, observe whether the slide stop can engage the original slide stop notch with the slide fully rearward. If necessary to obtain full and positive slide stop engagement, file or grind forward the rear face of the slide stop. Sometimes cutting this surface forward only 1/32-inch will make the difference between poor and 100 percent positive functioning.

This completes the basic operations of shortening, and at this point the gun should be thoroughly function-fired with service ball and any other ammunition it is intended to digest. Sights should now be installed upon the slide of whatever type desired. Procedures for this are described in detail elsewhere in this volume. Also, at this point, the gun should be tuned and/or throated to handle perfectly whatever ammunition you'll be using. That, too, is described elsewhere.

Other Work

If desired, the front portion of the frame may now be cut off at a point just 1/32 to 1/16-inch forward of the rear face of the recoil spring tunnel. This is a minor point, but makes for a more workmanlike job and does reduce weight by a miniscule amount. Slight additional shortening can be obtained by replacing the original hammer with the burr type made for the Colt Commander, and by cutting off all the excess metal from the rearward spur of the grip safety. The amount that can be removed safely here will depend only upon the shooter's hand and at what point (if any) the hammer pinches his hand against the grip safety. If the Commander hammer is used and the rear portion of its serrated knob ground away, most of the grip safety spur may be removed without risking damage to one's hand.



Engaging surface of slide stop must be cut forward in order for slide, with reduced travel, to be engaged properly.

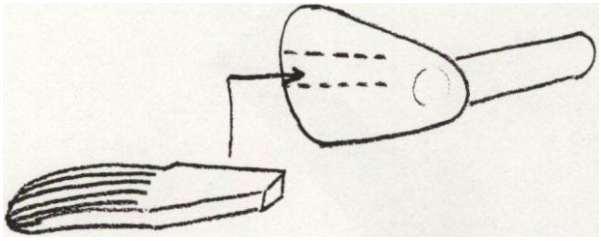
At this point, most pistoleros become concerned with improving the gun's handling and speed rather than with further reductions in size or weight. A combat-style safety offers a larger and longer thumb piece, increasing leverage for quick operation and making it easy to reach with the firing thumb as the gun is drawn, cocked, and locked. Swenson and others make excellent combat-style safeties which are quickly and easily installed, and this is probably the easiest route, though the cost of such a safety in the white is $15 or more. The original safety may be similarly modified at no cost with less than half an hour of labor.

If you are good with a torch, simply build up mild steel rod to extend the original thumb piece about 3/8-inch forward and slightly outward. Then, file or grind the weld to the general contours shown, and finish by stippling or filing in lengthwise serrations. Thin the corner of the grip so the extension can lay close-in.

That's all there is to it.

If soldering equipment is all you have available, file a piece of 1/16 to 3/32-inch steel to the shape shown, then bend it into a slight arc. File a groove or flat on the original safety to accept the new thumb piece, then silver or hard-solder the piece in place. Finish by beveling or radiusing the edges and serrating or stippling.

If a left-hand or ambidextrous safety is desired, one is best advised to purchase the Swenson or Behlert parts and install them as per the instructions. However, if you prefer to make the parts yourself, the Swenson safety is relatively easy to copy. The photograph shows its essential features. Cut off the original safety shaft exactly in the center, then with a cutoff wheel in your Dremel Moto-Tool, notch the end after the fashion of a mortise-and-tenon joint and polish the cut surface smooth. Cut a piece of matching-diameter drill rod about 3/4-inch long and carefully grind one end to fit closely and neatly into the notched end of the original safety shaft. Insert the original safety in the gun and insert the new half-shaft in from the right to mate up closely with it. Scribe a mark on the new shaft flush with the right side of the frame.



A combat thumb safety which would cost nearly $15 commercially can be made by simply filing a flat on the outer face of the original safety, then silver- soldering in place an outward and forward extension of the general shape shown. The extension must be positioned so that it does not interfere with slide movement, and may require that some reshaping of the grip be done to provide clearance for its own up-and-down movement.

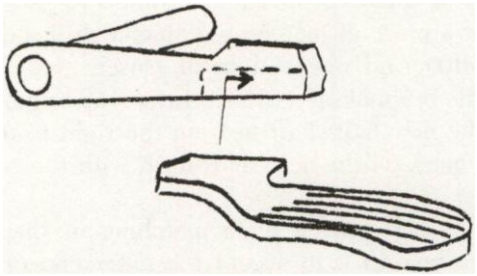
Cut from 1/32-inch steel a plate matching in shape the original safety and drill a hole in it to accept the outer end of the new halfshaft. Braze or weld the two together, the inner edge of the plate even with the scribed mark. From this point on, it is simply a matter of welding up or soldering on a thumb piece as already described, and trimming off the surplus end of the shaft.

The right half of this ambidextrous safety is held in the gun only by the right-hand grip plate. Consequently, this grip must be inletted on its inner surface so that the safety thumb piece may move freely when the grip is screwed tightly in place, but the inletting should not allow any surplus outward movement.

Traditionally the ·45 and other autos are reloaded during a fight from the slide-open position by punching the magazine release with the firing thumb, dropping the empty magazine to the ground, and immediately ramming a fresh magazine in place with the off hand, followed by instantly depressing the slide stop with the firing thumb to run the slide forward and chamber the top cartridge from the magazine. Persons with large hands or long thumbs can often reach the slide stop and accomplish this without shifting their grip on the gun. Unfortunately, most of us cannot do this. The Norwegian copy of the M1911 Colt attempted to solve this problem by lowering the slide stop thumb piece and extending it somewhat to the rear.

A proper combat-type slide stop utilizes the same principles, but carries the thumb piece farther rearward. The illustration shows the difference clearly and a combat stop is formed just as outlined for the safety by either welding or soldering on an extension thumb piece. Care should be taken here to not make the thumb piece too large or it may cause the gun to jam in a tight fitting holster. Aside from that, adequate clearance must be left for the spring housing and the grip is cut back to allow free movement of the stop. Final shape and dimensions are strictly a matter of personal preference.

Since rapid reloading is of paramount importance in a combat gun, magazines should be polished smooth and the inside of the magazine well should be deburred so that an empty magazine will always fall clear of its own weight. Do not rely upon pressure by the slide stop upon the follower and spring to eject sticky magazines. This pressure will help, of course, but every magazine to be used with a combat gun should be hand-fitted so that it will fall free without that added push.



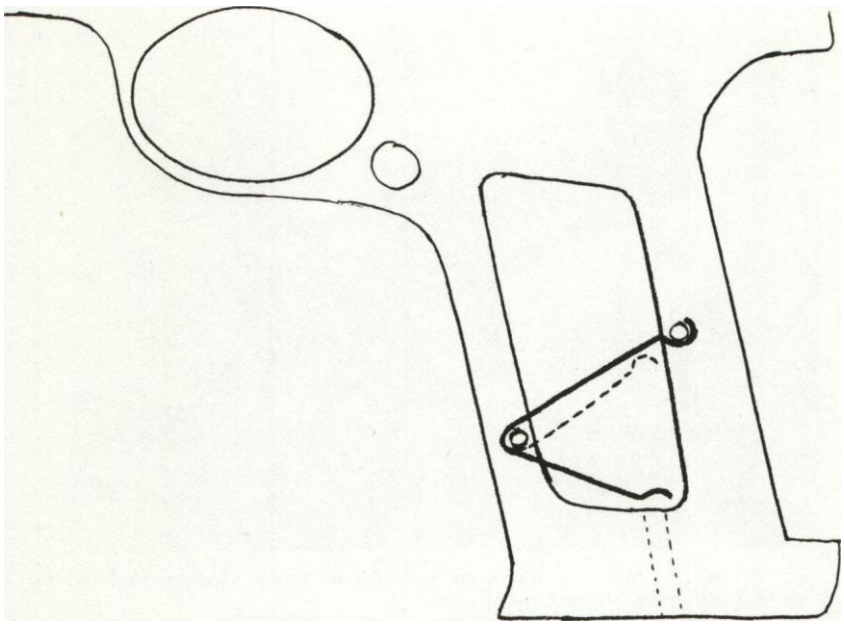
Combat-style slide stop is formed by filing outer rear surface of original stop flat, then shaping and silver-soldering in place the longer and wider thumb- piece as shown. On some guns this extension must be swung outward to clear a portion of the grip and also the spring and plunger housing; on others it may be kept close in to the frame. Make certain the extension does not drag on the slide as it recoils rearward.

Further, to facilitate insertion of fresh magazines, the mouth of the magazine well in the butt should be filed to funnel-shape as shown. This greatly facilitates immediate entry of a magazine in the event you don't get it perfectly aligned on the first thrust. Beveling the mouth allows the magazine to be rammed home easily, even if it is 1/16-inch out of line in any direction. This may seem like a small thing, but a split second saved in a gunfight can be the difference between life and death.

Since ejected empty magazines usually strike butt-first on the ground or pavement, Armand Swenson first cemented leather pads to the magazine base plate. This is easily done by epoxying a scrap of sole leather in place and then trimming it flush with the base plate with a sharp knife.

If you are overly concerned about positive ejection of empty magazines, the simple spring ejector shown can be fabricated and installed on most auto pistols in a very short time. Construction is clearly indicated in the photograph, and location and shape of the ·020-inch music wire spring are not critical. The grip must be inletted to fit over the spring, and a 3/64-inch-thick stud must be silver-soldered to the side of the magazine to bear against the upper arm of the spring. Then, a clearance groove must be filed in the left side of the magazine well mouth to allow passage of that stud.

When the gun is so altered, standard magazines may be used in it without any problem whatever; they simply won't engage the ejector spring. On the other hand, magazines so altered cannot be used in any unaltered gun, and if you happen to be in a situation where magazines would be exchanged between individuals, this could create a problem.



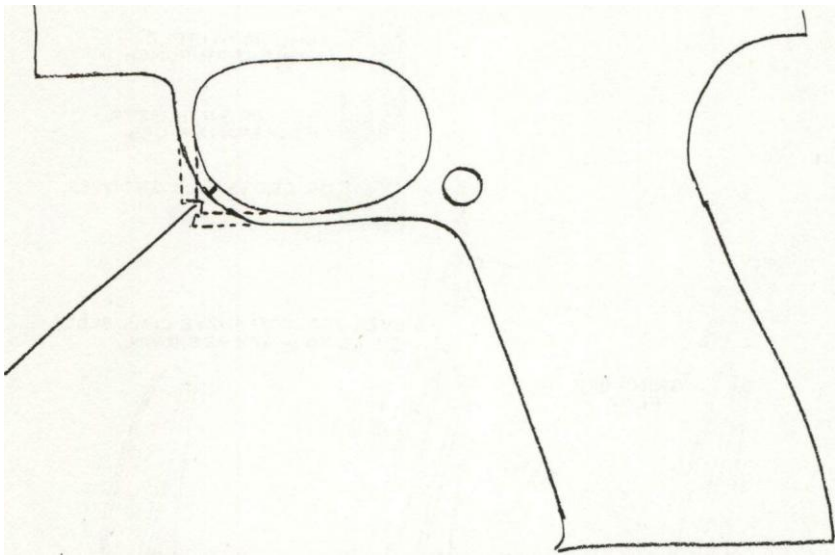
A simple magazine-ejector spring installed under an autoloader's grip. Two pins or screws locate upper end and center of spring, leaving power end to be pushed up and compressed by lug soldered on side of magazine body. Broken line shows position of compressed ejector spring when magazine is fully seated and latched by magazine catch. Releasing catch then allows compressed spring to hurl magazine from butt of gun. Broken parallel lines below spring outline location of groove needed inside magazine well to provide clearance for the spring-engaging lug attached to the magazine body.

Most schools now teach the use of two hands for combat shooting. We won't go into the methods taught here, but essentially the gun is gripped conventionally in the firing hand, and then the off hand is brought up and cupped around the firing hand, with the forefinger extended forward and wrapped around the front of the trigger guard. Unfortunately, most trigger guards are so rounded at the front that there is very little purchase for the finger. This may be corrected in either of two ways. First and simplest consists of building up the front lower portion of the trigger guard and filing or grinding it to shape as shown. It may be squared off, or the lower edge may be carried slightly forward after the fashion of the ASP to provide more of a pocket for the finger. It's a matter of preference. Alternatively, the trigger guard may simply be heated and forged or peened out to greater length and thinner section to allow bringing it to a squared shape. Aesthetically it produces a more appealing appearance, but functionally it doesn't differ from the build-up method.

Square trigger guard as produced by custom 'smith, George Sheldon, by welding and reshaping original guard.

If the forging and peening seems a bit much for you, simply saw the guard through at the point shown and bend both sections straight. Saw and file a piece of steel to a similar section to fill the gap and square the front of the guard, and then silver-solder or weld it in place. Silver solder is entirely adequate, but will show through a blued finish, so really should be utilized only when the final finish is to be plated. After the guard is reshaped to suit, further improvement is obtained by serrating, checkering, or stippling the front surface where the finger rests.

Controllability is of paramount importance in a combat gun. Consequently, it is more or less standard practice to stipple, checker, or serrate the entire front strap, and also the backstrap if it was originally smooth. These procedures are covered elsewhere.

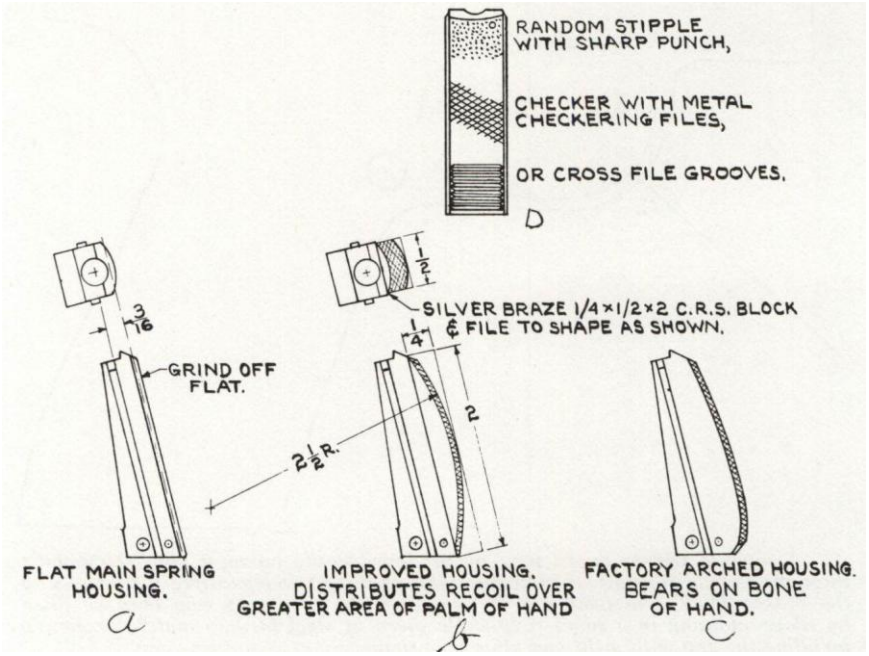


A squared trigger guard may be produced easily on most autos by sawing through the bow at arrow, then bending the resulting two legs straight as shown by the broken lines. The small gap left between the two ends may then be filled by silver-soldering in a small right-angle piece of steel filed to match, or simply by filling the gap with weld and filing it to shape.

An alternative solution to roughening the front strap is to be found in Frank Pachmayr's new Signature grips for the ·45 auto. This is a rubber-like grip molded in one piece to wrap around the front strap and screw in place as do the factory stocks. The side pieces are molded around steel reinforcing plates, so secure and unchanging attachment is accomplished. Both the grips proper and the part wrapping around the front strap carry molded checkering, and the feel and consistency of these grips are the best I have ever encountered for combat use. And, incidentally, Pachmayr offers grips of the same material for revolvers, and these have become quite popular for sixgun combat work.

Individuals with small hands often find the arched mainspring housing makes the grip circumference too large for good handling. As a result, it is often replaced by the smooth, straight, flat housing of the M1911 variation, or is sometimes ground or filed down to fit a particular hand. When either is done, the smooth surface should be roughened by one of the methods described.

Though the grip safety of the Colt/Browning 1911 design is considered desirable by most shooters, many have locked it out of action in one fashion or another in anticipation of a possible malfunction, which might result if one were forced to fire the gun hurriedly before a proper grip or hold had been obtained. Two methods exist for this— first, depressing the safety fully and then pinning it in that position by means of a hole drilled through the frame and safety. If a loose fitting, headed pin is used, it is held in place by the grip plate, and is readily removed to restore normal functioning of the safety. Otherwise, a tight fitting roll pin can be used without deleterious effect. Care must be taken that the pin does not protrude past the inner edge of the safety and interfere with the proper movement of the hammer strut.



The large, bulged mainspring housing of the M1911A1 may be reshaped a number of ways for better handling.

Old timers simply wrapped friction tape around the butt of the gun to hold the safety down and then attached the grips over the tape, a method which finds its modern counterpart in a wide rubber band looped tightly, completely around the butt. One may also bend a spring clip from thin 1/4-inch wide spring stock which snaps over the safety and the edges of the magazine recess in the frame to hold the safety depressed.

Regardless of the method used, if one intends deactivation of the grip safety to be permanent, nearly a half-ounce can be removed by grinding and filing the safety to a thin shell from the inside.

In further interest of reducing weight, if one were so inclined, he could simply take a piece of aluminum and file and grind a thin shell replacement for the non-functional grip safety and pin it in place permanently. I have also seen aluminum replacement mainspring housings, and one could fabricate the same easily with nothing more than a drill press and hacksaw and files if he were willing to spend a couple hours at the job.

A substantial weight reduction and considerable improvement in concealability can be had by shortening the butt and magazine. As already mentioned, butts have been successfully shortened as much as one full inch without reducing reliability. Personally I feel this is too much, and the abbreviated butt makes rapid-fire control difficult. I prefer no more than one-half inch off the butt, and my personal gun has been shortened only 3/8-inch. This still leaves plenty of handle and reduces magazine capacity by only one round.

This may be accomplished in two different ways. The first consists of simply sawing off 3/8 of an inch of the butt parallel to the original bottom line, leaving only a very small portion of the original web at the bottom of the butt, and then welding up the segments of the grip screw bushing hole which the cut leaves. If one is content with singlescrew attachment of each grip plate and makes special grips which dovetail or clip into this web at the bottom, this is an entirely satisfactory method of shortening the standard steel frame.

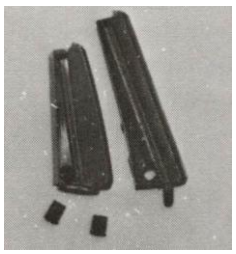
But, if it is desired to retain the bottom grip screw, it is then necessary to weld or silver-solder in a filler plate on either side and then drill and tap it for grip screw bushings.

Alternatively, you may cut out a 3/8-inch section of the front and backstraps above the web and then butt-weld the bottom back in place. This is considerably more trouble to accomplish, but presents a far more workmanlike appearance in the end. The cutoff portion must be very carefully aligned—preferably by a plug in the magazine well —and first tack-welded carefully in place. After that, the welding can be completed, making certain complete penetration is obtained. The job must then be finished by careful filing and grinding down of the welds flush with the original surfaces, both inside and out.

Mechanically, and insofar as strength and durability is concerned, there is little choice between the aforementioned methods. Each works fine, and it depends mainly upon the tools you have at hand and the amount of work you're willing to do.

This applies to all military and commercial versions of the steel- frame Colt and to the commercial Colt Commander. However, there are both aluminum-alloy and steel frames produced by independent manufacturers which do not have the large cutout machined at each side of the butt. On these frames it is possible to cut 3/8- or 1/2-inch off the butt and still have plenty of room left in the web for installation of grip screw bushings at the bottom.

This aluminum-alloy Government Model frame offered by A&R Sales will accept standard Colt or military-contract parts and is ideal for a short-butted gun inasmuch as it does not have the weakening side cutouts in the butt.



Mainspring housing on left has been shortened 3/8″, plug brazed to bottom of spring hole, and utilizes short screws for attachment to frame in lieu of the original pin.

Shortening the frame, of course, requires shortening and other alterations of the mainspring and housing. Up to 3/8-inch can be accommodated by simply cutting the same amount off the bottom of the housing and then silver-soldering a 1/32- to 1/16-inch thick steel plug in the hole thus exposed. After that, the mainspring plunger is discarded and two or three coils are cut off the spring. The mainspring cap is then altered as shown to provide more room at the top for the spring and the spring and cap are reinstalled in the housing and secured by the cap pin. No alterations are then required to the hammer strut.

So altered, the mainspring housing will leave a 1/16-inch or greater gap between its inner surface and the rear of the magazine well. If this offends your eye, it is a simple matter to weld or solder a spacer at the bottom of the housing to fill the gap.

The shortening removes the original housing pin holes, and so an offset 1/16-inch hole must be drilled through both frame and housing so that it does not interfere with mainspring functioning. The housing is then held in place by a 1/16-inch pin.

With the butt and housing shortened, the sear spring will also be too long for the space available. The simplest method of correcting this is to merely cut 1/4-inch off the bottom of the spring, and drill a hole through it at the point shown. A corresponding hole is drilled and tapped in the rear wall of the magazine well in such a position that the three fingers of the sear spring fall in the same position that they did before shortening. The spring is then attached by a screw having a thin, flat head. On my own guns I have taken a somewhat more difficult route, first shortening the spring and then duplicating the original bent tab and cutting a transverse slot in the back of the frame to receive it—just as existed on the original gun. Bending the tab on the spring isn't difficult, but cutting that very thin slot can be a bear of a job, so screw attachment is the simplest and works just as well.

Once the butt has been shortened, the original grips may also be cut off and fitted, or special grips may be made as described elsewhere.

Once all the butt-shortening operations have been performed, slip a standard magazine in the stripped frame and carefully file the notch in front of the butt as required to accept the forward protrusion on the magazine floorplate. Don't make this notch any deeper than necessary to accommodate the bare thickness of the plate.

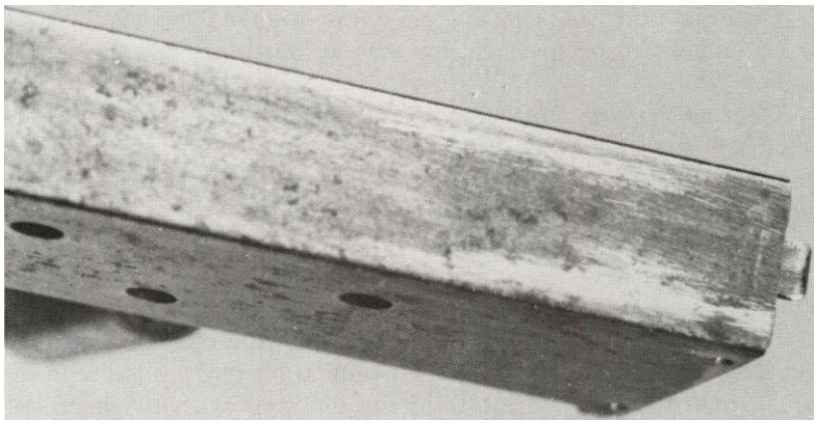
Next, slip a new, unworn magazine in the frame with magazine catch installed. With the catch engaged, press the magazine downward firmly and scribe a line around the magazine box flush with the butt. Saw the bottom of the magazine off and file back squarely to the scribed line. If the magazine is of the old style with the floorplate pinned in place, drive the pins out and salvage the original floorplate. It may then be fitted to the cut off magazine body by filing a notch in the front for its extension, drilling the necessary holes and driving in tight fitting pins which are then riveted over at their ends and polished smooth and flush with the body. Alternatively, you may simply silver- solder the base plate in place.

If your magazines are of later manufacture with floorplates brazed in place, you can still reuse the plates by filing or grinding away the magazine walls and then installing them in the shortened magazine body as you wish. However, it's usually less trouble to simply saw and file new floorplates out of 1/16-inch thick steel and silver- solder them in place.

In reality, it may be simpler and cheaper in the long run to merely order magazines of the proper length from Triple K. This company makes up all manner of special and custom-made magazines and has supplied many such shortened magazines for my own guns.

A special feature which appeals to me may be added to the magazine. It is simply a full-magazine indicator—a tab or plunger which protrudes through a hole in the floorplate when the magazine is completely filled. If you carry spare magazines upside down in a belt pouch, this can be advantageous.

Installing such an indicator is accomplished by filing a small notch centered at the rear of the floorplate and then by soldering a comparable, thin strip of steel to the inner face of the rear leg of the follower—so that it protrudes through the hole when the follower and spring are fully depressed by all the cartridges which the magazine will hold. After checking with a full load of cartridges, the tab is cut off so that it protrudes beyond the floorplate just enough to be easily seen or felt; about 3/64 of an inch.



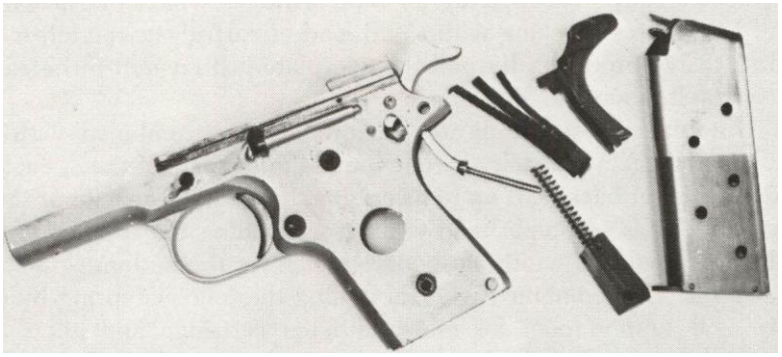
Fitting extension on rear of follower and cutting hole in bottom piece to allow it to protrude forms a full-magazine indicator.

Alternatively, the indicator feature may be combined with increasing magazine capacity by one round (in the case of the 3/8-inch of shortening) or backing it up to its original full length capacity of seven rounds. This is accomplished by filing or grinding the rear leg of the follower down to a width of about 3/32-inch for the bottom 3/8-inch of its length. This, combined with shortening the follower spring by one turn will supply room for one additional cartridge and allow the slimmed down tail of the follower to protrude through the hole in the floorplate as an indicator.

Ever since Smith & Wesson introduced its M39 pistol with the so- called military magazine whose side walls are cut away almost completely, some shooters have felt that this design reduces the chance of feeding malfunctions due to dirt in the magazine or magazine damage. If you are going all out on a combat conversion, the side walls of the ·45 magazine may be cut away in the same fashion. While there are a number of ways that sheet metal jobs of this sort may be done, care must be taken to insure that the remaining walls are not pushed inward or that large burrs are not turned up on the inside of the cut, either of which will prevent smooth cartridge feeding. To avoid this, I shape a hardwood block to a snug tap-in fit in the magazine body, then scribe the outline of the cutout, and then drill overlapping 3/32-inch holes around the curves. Then, the straight lines between the curves are cut with a Dremel Moto-Tool and thin cutoff discs, the plug removed and all the cut edges trued up and deburred with files and sanding drum in the Moto-Tool. When the job is done in this fashion, there will be no deformation of the remaining magazine walls, nor will there be any burrs to interfere with smooth feeding.

Since even a small amount of rust or congealed dirt and oil on the inside of the magazine can interfere with proper feeding, I have found it advisable to have all magazines for combat conversions either hard chrome plated inside and out or thinly coated with Teflon. Teflon coating on the follower will also add somewhat to the certainty of feeding.

If more than 3/8-inch is to be cut off the butt, further changes must be made in the mainspring and hammer strut setup. The photograph shows the simplest method of achieving reliable functioning with massive shortening, however, no specific dimensions can be given since they will vary with the exact amount cut from the butt. Essentially, the mainspring housing is shortened the same amount as the butt and plugged as before. Then, the mainspring cap and cap pin are discarded and a clearance cut, 1/8-inch wide, is made about 1/2-inch deep and centered in the front flat of the housing.



The C&M shortening job disassembled to show details of the alterations necessary in the mainspring, housing, and hammer strut to permit proper functioning when a full inch is removed from the butt.

The mainspring, shortened by two or three coils, is then dropped loosely into the housing and a small washer is placed on the mainspring strut and brazed in the position where the mainspring will be compressed about 1/8-inch with the hammer down on the firing pin. Several fittings may be required to locate this position. Then, if necessary, the mouth of the hole in the housing is funneled slightly so that the washer will not hang up on its edge as the mainspring is compressed. Further clearance may be required at the front edge of the hole and it may be necessary to file away part of the washer at the same point in order to obtain smooth functioning' as it compresses the mainspring.

This may sound a bit complicated, but it is actually quite simple when you have all the parts laid out in front of you and understand their functioning.

Even when all of the above alterations have been performed upon a steel-framed ·45, the gun will still be fairly heavy for its size. A small weight reduction can further be achieved with files, hand grinder, and drill press. The amount of work required is out of proportion in comparison to the amount of weight which can be removed, but the true handgun buff probably doesn't mind this—I know I don't. The butt area of the frame may be skeletonized by drilling holes as shown, and further metal may be removed in the areas adjacent to the magazine and trigger guard. You may also greatly deepen and extend rearward the relief cuts that provide finger clearance behind the trigger.

This shortened frame has been drilled with numerous holes under the grips to reduce weight.

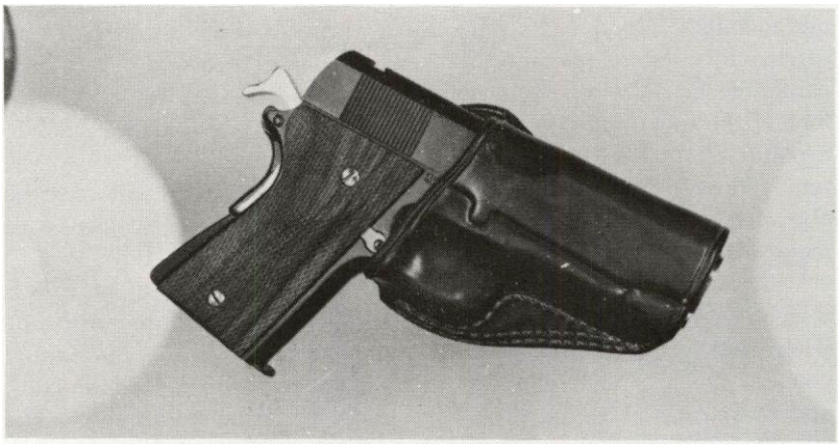
More weight can be removed from the slide. Machining or filing a wide flat on top of the slide takes away some weight and also provides a better sighting plane which then may be matted, stippled, or otherwise roughened to reduce glare. If a milling machine is available, deep lightening cuts may be made at the upper rear of the slide, extending forward and ending just behind the slide breech face. Similar though more shallow cuts may be started just ahead of the ejection port and carried forward to the muzzle, then, if no lug recess has been machined in the slide muzzle for the issue-style barrel bushing, up to 1/1 6″ inch of the metal may be removed from both sides of the slide back to a point just in front of the locking lugs. This much metal cannot be removed over the guide ribs and grooves, though, so the cut must be above that area, or at least stepped up to leave sufficient thickness of metal over the grooves.

If you are determined to remove the last milligram of excess weight, you will find a number of small areas on both slide and frame where bits of metal may be cut, ground, or filed away. Conceivably you can reach a point where nothing but a paper-thin shell remains, and in that case I would expect the gun's life to be rather short. The weight of the all-steel gun can be brought down to as little as 23 or 24 ounces by careful and persistent metal removal, and the aluminum framed version can be whittled down to a bare 19 ounces while still retaining adequate strength and mass for adequately long service. Certainly there is no reason for going any farther than that. After all, most ·380 caliber pocket pistols weigh in excess of 20-21 ounces. A ·45 of that weight is difficult to control, and becomes purely a specialist's gun. It ain't for the faint of heart!

While this has described the basic modifications and refinements necessary to convert the Colt Government Model to a purely combat arm, the majority of the operations may be performed on other makes and models with only minor changes. For example, the shortening operations remain essentially the same on all guns containing a slide covering the barrel and carrying their recoil springs beneath the barrel. This applies to the Browning HP, Llama Colt copy, Star and Ballester-Molina models, Radom Vz 35, and all others of basic Browning type. This even includes the more recent S&W M59 and M39 pistols, despite their relative newness.

Likewise, modification of safeties and slide stops for smoother and more rapid operation without shifting your gun hand is the same for all, from Astra to Walther. Minor frame alterations such as shortening up front, squaring or building-up trigger guard, reducing weight, checkering and stippling, etc., may also be performed in the ways already described which apply to virtually any autoloader.

However, when shortening frame butts, one encounters a wide variety of mainspring and magazine catch designs which make it necessary to develop special procedures for different models. For example, the Browning and Star have solid backstraps, the former containing its mainspring in a vertical hole therein, the latter with its mainspring supported by a bracket inside the strap. The Star may be easily sawed off a small amount without interfering at all with the mainspring function, while the latter requires extensive modification and refitting of the entire mainspring train if any significant amount is removed from the butt. The S&W M39/59 is coming into its own as a basis for a combat conversion, and it poses few problems except that the bottom portion of the backstrap must be welded back into place to support the mainspring after frame and strap are shortened.



Shortened both ways, this Colt GM is ready for service.

In reality, it would take half of this book to cover the detailed and varied procedures that may be applied to the many autoloader models which one might wish to convert to combat use. Most other models see little, if any, use in this respect; the Colt Government Model being the most popular at the moment as well as being the basis for almost all development in this field, with the Browning HP next, and the S&W M39 following—though the order of preference of the last two is rapidly changing with the advent of Paris Theodore's Seventrees Asp and similar conversions now being offered by other shops.

The smaller pocket-size autos in ·32 and ·380 caliber may often be shortened with relative ease. While it is possible to shorten those with under barrel recoil springs in essentially the same manner as the big guns, by far the most popular models for this purpose are the Walther, Astra, Beretta, MKE, and Beretta models with tubular slides and recoil springs surrounding the barrel; and, of course, the long Browning M1922 manufactured in such great quantities as a military arm up through WW II.

M39 frame on left, shortened ASP frame on right. Note that as butt is shortened, it becomes weakened unless reinforcing plates are soldered or welded into frame cutouts.

The only limitation placed upon the shortening of these pistols from the muzzle is that of maintaining adequate recoil spring length. For all practical purposes, the original length of the Walther PPK represents the minimum length that can be achieved. For the longer Walther PP series, it is necessary only to cut the slide off to PPK length, braze in a new barrel bushing at the slide muzzle, shorten the recoil spring a comparable amount, and finish the muzzle off flush with the slide. The same applies to the Browning and other models just mentioned except that one must measure the internal space available for the compressed recoil spring with the slide fully rearward, and then base the amount cut off on how much spring space will be left. It is best not to reduce the spring space below that found in the Walther PPK.

Butts may also be shortened in these smaller guns, but such a variety of mainspring setups and magazine catch positions exist that each design must be considered separately. Generally, it is possible to cut 1/4 to 3/8-inch off the butt and then reposition the mainspring seat without difficulty. As an example, the Walther PP may be shortened to PPK butt length, and the Browning M1922 cut to M1910 length.

Naturally, any finish normally applied to any other gun made of similar materials may be applied to a combat conversion. While conventional bluing is probably still the traditional favorite, combat guns are carried under conditions such that a blued finish doesn't last too long. They are exposed to extremes of temperature and humidity, even to sand, snow, and rainstorms, and they are often exposed for long periods to perspiration acids and moisture. Under those conditions a highly corrosion-resistant plated finish is much to be preferred. If the traditional dark color is essential, the "black chrome" finish supplied by Marker Brothers in Charleston, Illinois has no peer, and the matte or sandblasted version should be specified rather than the bright polish.

If you go in for bright finishes, then my personal preference is the Armoloy process of chrome impregnation applied by Armoloy Inc. (206 East Daggett St., Fort Worth, Texas 76104). This process produces a molecular bond between base metal and chrome, rather than the mechanical bond of conventional plating. The resulting surface coating is very hard, has a very fine matte surface, and has built-in lubrication that can improve functioning.

Next in order of desirability is conventional nickel plating in either a bright or matte surface. Any good gun refinishing house can apply this to either steel or aluminum.

Unfortunately, neither black chrome nor Armoloy can be applied to aluminum alloy parts. I say unfortunately, because aluminum frames are more easily dented and marred than steel. Such damage doesn't affect function, but it does depreciate appearance. Actually, aluminum being noncorrosive by nature, such frames may simply be polished and/or sand blasted to present a durable and attractive though easily marred finish. Several of my own guns carry this natural aluminum finish in combinations of bright polished flat surfaces and sand blasted curves and edges, and they look quite good.

If you elect any of the special finishes, rest assured you'll have to send the parts out to have them applied. The better finishes are simply too sophisticated to be applied by the home pistolsmith. On the other hand, if you elect to polish and/or blue, you'll find the subjects covered in detail herein under refinishing.

Generally, combat conversions are carried out on either SA or DA guns without any thought of changing the firing mechanism. For years, though, DA functioning has been available only in guns of 9mm and smaller caliber. Thus, many a ·45 fancier has wished for a way to change over his combat gun.

This can be done now, and is ideal for a combat conversion. It is definitely not something that can be done by the average home gunsmith, or even in most of the better-equipped and experienced pistol shops. The only practical and readily available double-action system in existence at the moment is that developed by Louis Seecamp and it is available only through him, applied in an extensive modification to the customer's gun for about $100 per copy.

This provides true double-action, first-shot capability by means of a new trigger and drawbar connecting directly to an actuating stud on the foot of the hammer. The new DA trigger draws the hammer to the full-cock position when pulled, and simultaneously moves the original sear out of the path of the hammer to allow it to drop and fire the cartridge. However, the original sear continues to function as designed and catches and holds the hammer at full cock for subsequent shots or when the hammer is manually cocked. It is actuated at the proper point in time to release the hammer by the original trigger stirrup which remains in position directly behind the new trigger—which forces it rearward at the proper time in the firing cycle.

Detail of Seecamp conversion with side plate off, drawbar removed and laying on slide.

So, if you want genuine double-action functioning in the Government Model or your combat conversion, it may be obtained by the simple expediency of arranging to have Seecamp do the work. Then you can go ahead with the other alterations, making certain they don't interfere.

At the other end of the double-action scale is a conversion kit marketed under the name "Double-Ace" by Caraville Arms (650 Moorpark Road, Thousand Oaks, Calif. 91360). This unit replaces the grip safety, mainspring housing and contents, and the hammer strut of the original. It comes fully assembled and is installed in moments by removing the parts just mentioned, attaching the new hammer strut to the hammer, and pinning the unit in place with the thumb safety and a new mainspring housing pin.

The Double-Ace, however, does not provide true double-action functioning. Instead, it replaces the grip safety and mainspring housing with a single, long backstrap member which is pivoted around the safety shaft. When at rest, this member swings outward a bit at the bottom of the butt. Consequently, grasping the gun in the usual fashion and squeezing the butt firmly depresses this backstrap lever and through a system of cranks and rollers, compresses the mainspring and draws the hammer to full-cock. The trigger may then be pulled to fire the gun in the usual fashion, and after the shot it will remain fully cocked for subsequent firings. Alternatively, as the gun is grasped, the trigger may be first pulled, and then the backstrap lever squeezed—in which instance the mainspring is compressed and the hammer drawn fully rearward, and the hammer is then automatically released to fly forward and fire the cartridge. Afterward, functioning is as before.

While this is not double-action in the usual, accepted sense of the term, it does provide an accelerated method of cocking and firing the Government Model as it is drawn. A good deal of experience and shooting is required to become fully accustomed to this method of operation, but once that is obtained, it comes quite naturally and easily. The unit's only disadvantage is that persons with relatively small hands simply cannot span the additional width of the grip which is caused by the protruding backstrap lever. Persons with medium to large hands generally encounter no such difficulty.

The Double-Ace unit comes fully assembled and ready to install. No alterations or gunsmithing are required on the gun. And, if one takes the time to read the instructions first, only a few moments are required to fit it to the gun and get it into action. Depending on one's tastes, it can be a valuable addition to a service gun or combat conversion.

CHAPTER 24 - Accurizing Autoloading Pistols

Probably the most accurized and modified handgun in North America is the venerable Colt ·45 Government Model, also known as the M1911/A1. The ·45 auto is a Browning design and has been manufactured extensively by Colt in both commercial and military versions. During wartime, hundreds of thousands of them were manufactured by Remington and by Ithaca principally, though token quantities were produced by other firms and components by a variety of companies. In addition, a precise copy stamped "Modelo 1927" was manufactured extensively in Argentina, and a quite close, but not precise copy has been manufactured in Spain under the name Llama (Gabilondo y Cia) since the 1930s. Regardless of ancestry, all variations submit readily to substantial increases in performance via the process commonly referred to as "accurizing".

The basic accurizing processes can be readily accomplished by the persistent gun buff working at home with nothing more than handtools and patience. Various replacement parts and accessories designed to improve this gun s accuracy are readily available from a number of sources. See appendix for these sources.

Since the rather loose and rough military contract variation is the one most commonly in need of increased accuracy, we'll concentrate on these guns. The tighter commercial models sometimes require the same processes to a lesser degree, while the foreign copies may require even more careful work.

Accurizing consists primarily of improving the fit of various moving parts so that the barrel and slide take the most rigid and consistent position relative to the frame for every shot. Accomplishing this alone will wring the most in mechanical accuracy from the gun. Beyond that, improving trigger pull, sights, grips, and controllability will further greatly improve practical accuracy.

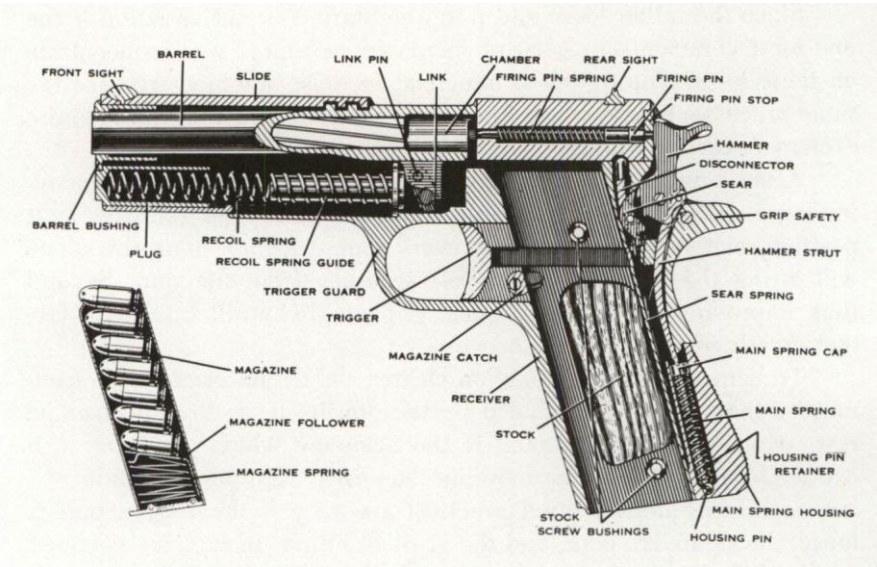
To help make this distinction clearer, we define mechanical accuracy as that accuracy produced by the gun itself, as from a machine rest; while practical accuracy is the accuracy which a shooter can extract from the gun. The most mechanically accurate ·45 made will not necessarily deliver good practical accuracy if the trigger pull is lousy, the sights are poor, and the grips ill fitting. In fact, an as-issued gun with first-rate target sights, a crisp clean four-pound trigger pull, and perfectly fitted stocks may well deliver greater practical accuracy than a carefully hand-fitted accurized gun without those features.

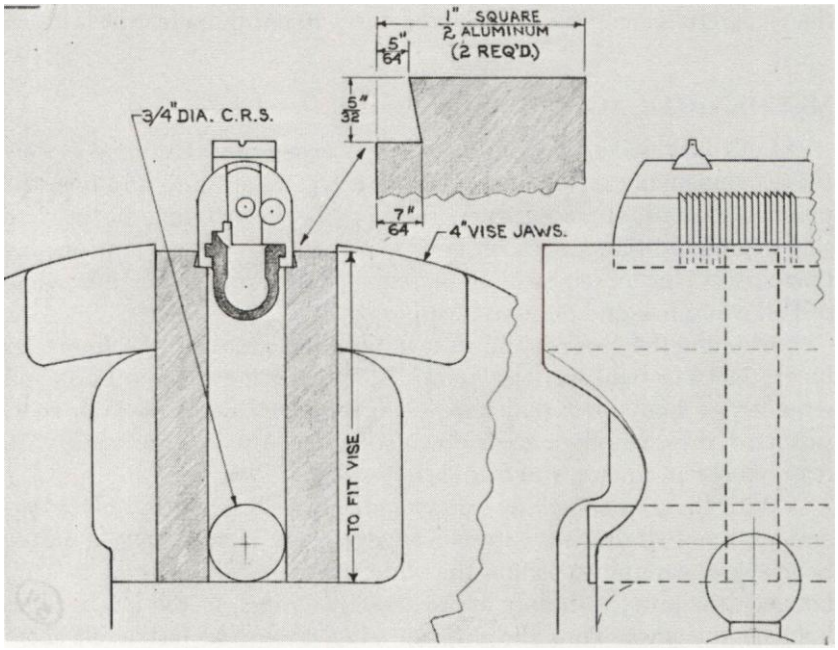
MECHANICAL ACCURIZING

Let's first delve into the mechanical accurizing. Examine closely the accompanying sectional drawing of a typical ·45 auto and note the points indicated where looseness develops between frame, barrel, and slide. Compare these areas on your gun and note the amount of play that exists. This looseness must be removed as much as possible while still allowing free and positive functioning.

Examine the grooves and rails in both the slide and the frame for burrs, dents, or bent sections. Scrape, stone, or file away any burrs and remove any high spots that have been raised by dents. If high spots rub hard, dress the high areas down so that you will begin work with reasonably flat, square, and true surfaces.

With the gun completely disassembled, we'll begin by taking lateral play out of the slide/frame engagement. If you have a heavy bench vise, carefully position the slide so it's level and right side up between the jaws, with only approximately 1/4-inch of the lower edges held by the jaws. Turn the vise up snug, then add just a bit more pressure, squeezing inward those portions of the slide carrying the guide ribs and grooves.





An easily made set of vise jaws for tightening the Colt ·45 slide on the frame. Details are apparent in the drawing; round, steel bar between the bottoms of aluminum jaws is essential for proper functioning.

Remove from the vise and slip it back on the frame. Less lateral play should be evident, but it should still be fairly loose. Put the slide back in the vise and add a little more pressure, bringing the guide ribs closer together. Try it on the slide again, and if still slightly loose, repeat the process until it requires considerable effort to move it through its full travel on the frame.

Don't make the slide so tight that it must be driven on and off with a hammer—and please don't overdo the vise bit so much that you can't get the slide back on the frame. It's a lot harder to spread the edges of the slide than it is to squeeze them in, so go easy and use plenty of "fit and try".

Squeezing the slide may have reduced vertical play somewhat, but that is only incidental. The balance of vertical looseness must be corrected by peening the guide rails to produce narrower grooves. This can be done on either the slide or the frame, though most prefer to peen the frame because it is easier to clamp and handle.

Whittle out a pair of wooden blocks to support the frame as solidly as possible and then clamp it firmly in the vise, exposing about 3/8 of an inch of its upper edges above the jaws. Be careful not to turn the vise so tight that you compress the frame.

Now take a small, smooth-faced machinist's hammer and with light, even, overlapping blows, tap the entire upper surface of the guide rails on both sides of the frame. Try to keep the blows as uniform and consistent as possible on both rails.

Slip the slide on the frame and move it through its full travel; note how much reduction in vertical play has taken place. Then, repeat the peening process and check slide fit again. Continue until virtually all of the vertical play has been removed—but take care that you are not mislead by simple tightness caused by outward expansion of the rails. Since lateral play has already been removed by squeezing the slide, peening along the top of the frame rails will cause some outward growth of those rails and this will make the slide much tighter laterally. It's easy to mistake this tightness for absence of vertical play.

When both vertical and lateral play have been removed, the slide should be quite tight on the frame, even to the point of requiring persuasion by a soft hammer to move it. At this point, remove the slide, and scrape or file away any burrs or feather edges that have been produced. Generously apply a high-film-strength lubricant, such as resizing lube, to both the slide and the frame and drive the slide through its full travel until it can be moved by hand.

Remove the slide and wash off all lubricant with solvent, then smoke the frame rails or coat them with layout blue or some similar compound, reinstall the slide, and move it a couple of times through its full travel. Remove the slide and examine the frame rails closely for high spots where the soot or blue is scraped off.

Stone or polish these high spots lightly, recoat the rails, and check again with the slide. Repeat this process until uniform bearing is produced, or until the slide becomes loose on the frame again. If looseness occurs before even bearing, repeat both tightening processes to a slight degree and then recheck, using soot or blue again.

Eventually you'll reach a point where there will be little or no perceptible play between slide and frame, yet when lightly lubricated, the slide will move quite easily through its full travel. When that point is achieved, the slide and frame are properly fitted and accurized.

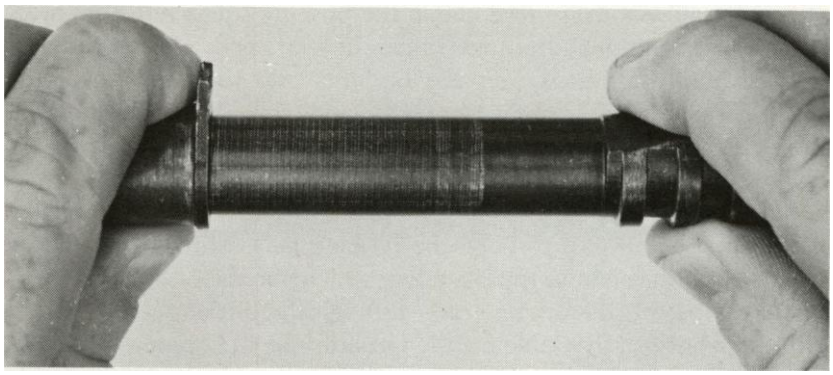
Next comes elimination of excess barrel play at the slide's muzzle. It's possible to build up the original barrel bushing and accomplish this, but considering that replacement accuracy bushings are economically priced, they offer a far simpler solution. Buy an accuracy bushing (Micro makes good ones), then carefully deburr it and its seat in the slide. Before attempting to install the bushing be sure to check its fit on the barrel's muzzle. The barrel should not pass through the hole in the bushing; it's essential that the hole be undersized for further fitting.

Align the bushing retaining lug in the cutout in the slide muzzle and tap the bushing lightly into the cutout's full depth. It should not enter freely; instead it should be tight and require a fair amount of pressure to be seated. If too much pressure is required to seat the bushing, pull it back out, smoke it, and check for high spots that can then be stoned or filed down slightly until light taps with a plastic hammer will seat the bushing fully.

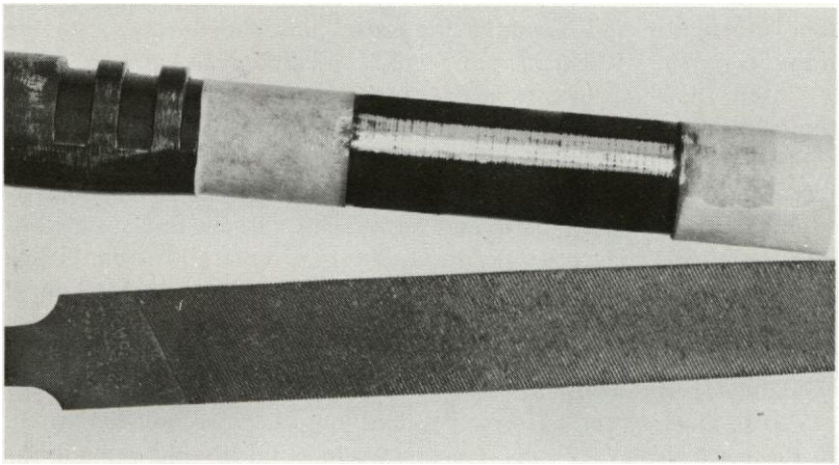
Then, using a bushing wrench (supplied by the maker), turn the bushing to its locked position. This should require a substantial amount of force, but should still be possible by hand. If too much resistance is met, remove and smoke the bushing and locate the high spots that are interfering with its rotation.

Remove the bushing and check its inside diameter as compared with the outside diameter of the barrel at the muzzle. If there is more than a few thousandths of an inch (perhaps ·005), either polish or ream the inside of the bushing until the hole is only about ·005 of an inch smaller than the barrel.

Go back to the barrel and from a point one-quarter inch behind the muzzle, reduce the barrel diameter by ·010 of an inch all the way back to the beginning of the swell in front of the barrel lug. If you've a lathe, this is a simple process, however, it can be easily accomplished without one by simply cross-polishing that portion of the barrel with strips of abrasive cloth applied boot-black fashion. This operation can be speeded up by making very light, overlapping file cuts the length of the portion to be reduced. If you choose this method, though, finish it up by cross-polishing to leave a smooth, perfectly round surface.



Bright area on barrel shows limit of bushing travel, the area which must be reduced when a tight bushing is fitted.



Barrel may be reduced by light, careful filing; smoke surface to make file cuts readily visible and outline work area with masking tape.

The foregoing operation is necessary to provide clearance for the barrel bushing to pass over the barrel after the rear of the barrel tips downward to unlock. Without this reduced-diameter portion behind the muzzle, the tight-fitting bushing will jam tightly against the angled barrel and the gun simply won't function. With normal commercial or military barrel-bushing clearance, this does not occur.

The barrel's muzzle and bushing now need to be lapped together. If you've a drill press, clamp the bushing squarely to the press table and chuck a mandrel (which can be brass or wood) in the drill press, carefully centered over the bushing. Slip the barrel over the mandrel and apply fine abrasive powder and oil to the muzzle portion. Move the barrel down into the bushing, and rotate the barrel by hand, while raising and lowering the barrel by means of the press handle, causing the abrasive powder to grind away the excess metal until the barrel muzzle will pass through the bushing hole. This operation may be started with medium-grit abrasive, which should be washed away before the barrel passes completely through the bushing and replaced with the finest grit available for the finishing steps. Lapping the barrel to the bushing in this manner produces perfectly round and concentric mating surfaces with a minimum of clearance between them.

Once this has been accomplished, clean all parts thoroughly and lubricate lightly and assemble the barrel and slide properly to the frame, complete with recoil spring, guide and plunger.

With the slide fully in battery, press downward on the portion of the barrel exposed in the ejection port to determine whether any vertical play exists. If there is looseness, it can usually be eliminated by the installation of a so-called "long link" replacement barrel link sold by suppliers of accurizing parts and accessories. Obtain and install this link in the next longer size, carefully fitting a replacement barrel link pin and lapping the bottom hole of the link to the slide-stop pin, if necessary, to obtain a perfect fit. If this long link does not remove all of the vertical play, the next longer link (usually three lengths are available) should be fitted.

If so much slop exists that standard long links will not remove all of the vertical play, it will be necessary to build up and reshape the barrel lug so that it contacts the slide-stop pin as the slide moves into battery and cams the barrel upward tightly against the roof of the slide. Heli-arc welding is preferable for building up the lug, though a careful workman can do a perfectly satisfactory job with an oxyacetylene torch.

The built-up area should then be carefully filed and polished, combined with repeated trial fittings until the slide goes tightly into battery while the barrel is forced solidly upward. A secondary advantage of the welding buildup on the lug is that the sides of the lug may at the same time be built outward a bit and then carefully dressed down until the lug will just barely enter its cut in the frame. This will remove any excess lateral play that exists at that point. This play doesn't seem to seriously affect accuracy, but its elimination certainly won't do any harm.

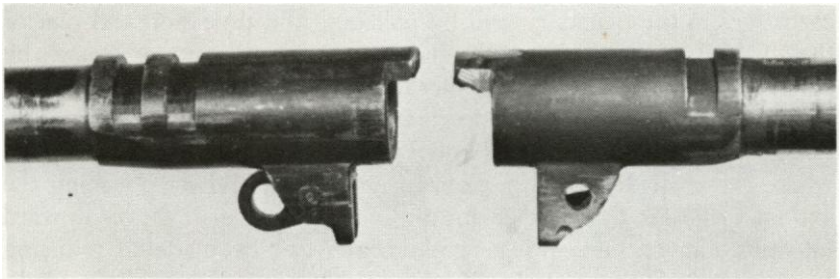
Once vertical barrel play has been eliminated, check the sides of the barrel tang to determine if there is any excess clearance between them and the slide recess in which the tang seats. A couple of thousandths of an inch of play here won't hurt anything, but if more than that exists, it should be eliminated by silver-soldering thin steel shim stock to the sides of the tang and then polishing the surfaces down to produce about ·001 to ·0015 of an inch clearance on each side.

Incidentally, if you are using a new National Match or special target barrel for the accurizing job, it will be provided with excess metal on the barrel tang to allow hand-fitting to the recess in the slide. Also, some of these barrels are provided with excess metal on the barrel lug to permit shaping so the slide-stop pin will cam the barrel upward.

The use of a National Match or target barrel will certainly simplify accurizing, but is by no means essential. In reality, a new military or commercial replacement barrel will—when properly fitted—give accuracy equal to the much more costly special barrels.

Once frame/slide/barrel fitting is done, the gun should be fully assembled and test fired with whatever you expect to use as standard ammunition. If all parts are fitted snugly as they should be, it is quite likely that during the first 50 to 200 rounds you'll encounter occasional malfunctions caused by excessive friction, preventing the slide from moving quickly through its full travel and also from going fully into battery. Addition of a recoil buffer may eliminate this problem.

Generally, the use of a molybdenum disulphide lubricant on all sliding and bearing surfaces and firing a couple hundred rounds will eliminate this problem. If it does not, it will be necessary to disassemble the gun and locate the high spots which are causing binding or excess friction and then polish them down.



Standard barrel, left, and welded-up barrel with lug and tang rough-shaped in preparation for final fitting.

FOR IMPROVED FEED RELIABILITY

When the gun is to be used mainly with full-charge loads (either lead-bullet handloads or full-jacketed commercial or military), feeding will normally be perfect without any further work. However, if light loads, semi-wadcutters, or high performance, jacketed expanding bullets are to be used, then some alteration of the feed ramp is often necessary to obtain 100 percent feeding reliability.

First, the barrel and frame sections of the feed ramp should be carefully polished glass smooth, at the same time eliminating overlap or sharp edges that exist where the two meet. The most common cause for feeding malfunctions is the bullet striking a feed-ramp overlap or a sharp edge and being held there. Lightly polishing the entire chamber mouth, to include the area where the feed ramp breaks into the lower chamber wall, will also improve feeding. Further modification may be required for proper feeding of some loads, but they are covered elsewhere in this book.

If your gun is to be used principally with full charge loads, then a standard recoil spring should be used. If light loads are to be its steady diet, it may be necessary to install a weaker spring to obtain full slide travel and positive ejection and feeding.

The simplest method of obtaining a weak spring is to clip two coils off a standard spring and then stretch the shortened spring to its original length. If full slide travel is still not obtained, then the spring may be shortened further by one-half to one coil until everything works. Of course, there is no point in working on the spring to obtain light-load functioning unless you've made absolutely certain that the slide moves freely through its full travel. For this reason, spring alterations should wait until the gun has been shot in and all high-friction areas have been smoothed out.

Further functional improvement may be achieved with light loads by carefully polishing the underside of the slide where it passes over cartridges in the magazine and by polishing the slide stop and rear of the slide where it rides over the hammer in recoil—and, of course, by polishing the portion of the hammer face which it contacts.

Sometimes light load feeding can also be improved—especially in rough military guns—by carefully polishing the slide's breech face where the cartridge head must slide up over it, and by polishing the extractor claw so that it does not dig into the case as it moves upward into position. In fact, any progress which can be made in reducing friction during slide travel will improve functioning with light loads. This can be carried even to the ridiculous by polishing the inside of the frame and slide where the recoil spring rubs somewhat as it compresses during recoil.

Those are the basic operations that establish the degree of mechanical accuracy that the gun will produce.

TOWARD MORE PRACTICAL ACCURACY

To increase practical accuracy, I have found that it is best to begin with the trigger pull. A lousy trigger pull will negate the advantages of good sights and stocks almost every time.

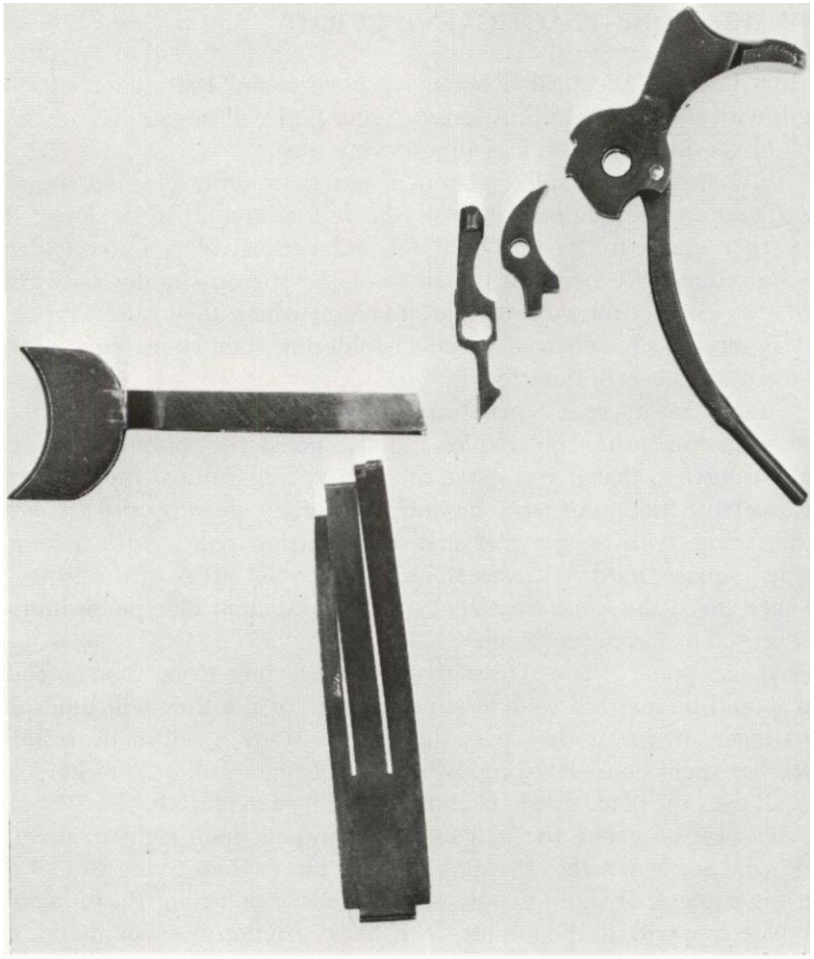
With the gun complete stripped and thoroughly cleaned, insert the trigger and determine if it moves freely fore and aft in its slot. If it does, then check for excessive lateral and vertical play. Lateral play can be reduced by bending the sides of the stirrup slightly outward until they contact the walls of the groove in which they ride. Vertical play is most easily removed by silver-soldering steel shims equally to the top and bottom of the trigger.

In both instances it is necessary to carefully deburr and polish the grooves in which the trigger rides and also polish the rubbing surfaces of the trigger so that it will move through its longitudinal travel without excessive friction or jerky motion. I generally clean up the grooves in the frame with needle files first, then further polish with a long, slender, square, hard Arkansas stone. The contact areas of the trigger are then given the same treatment and molybdenum disulphide lubricant is used to complete the job.

At this point, it is essential that the magazines to be used in this gun should be inserted to determine whether or not they will bind on the trigger stirrup as they pass through it. Many a self-made pistolsmith has spent hours laboring over a good trigger pull only to have it shift all over the place due to friction caused by a magazine.

It's best to smoke the magazine, depending upon sight to determine whether or not the stirrup is rubbing rather than trying to feel if there is contact. If there is only slight friction, polishing the sides of the magazine will do the job nicely. If heavy friction is encountered, it is easier to file or polish the necessary clearance on the inside of the trigger stirrup. Just keep in mind that the finest trigger pull in the world will feel terrible if you stick in a bent or oversized magazine that binds on the stirrup.

You should also carefully polish the angled rear face of the stirrup glass smooth. The sear spring and disconnector rub on it and their corresponding contact surfaces should be polished equally smooth. Any roughness will eventually be evident in a harsh or varying trigger pull.



These parts are all critical to a good trigger pull. Movement of parts in frame must be free and smooth, and all contact areas must be highly polished.

At this point, go back to the frame and examine the vertical hole in which the disconnector rides. If any burrs are evident, carefully remove them without enlarging the hole. At the same time examine the area inside the frame where the sear fits. Remove any burrs that might interfere with free sear movement, and do the same for the area around the hammer pin.

Check the fit of sear and hammer pins in their holes in the frame, and also through the parts they support. The parts should rotate smoothly and evenly on their pins, and the pins should fit snugly in their holes. If pins are loose in their holes in the frame, either obtain or make new or oversized pins so that they are a wobble-free push fit. It may be necessary to ream the holes in both frame and moving parts to achieve this type of fit. In the end it will be worth the effort, for looseness can cause shot to shot variation in trigger pull.

You have to go through all these procedures before you can do a good job on sear/trigger engagement. The engaging surfaces of the hammer's full-cock notch and sear nose should be correct as they come from the factory. If either of those areas have been chipped or badly worn, it is better to buy new replacement parts than to alter the old ones. First, polish the contact surfaces as smooth as possible, taking extreme care that the angles of those surfaces are not changed in the least. Originally those surfaces are finished by precision grinding and this leaves the surface flat and true, but slightly rough.

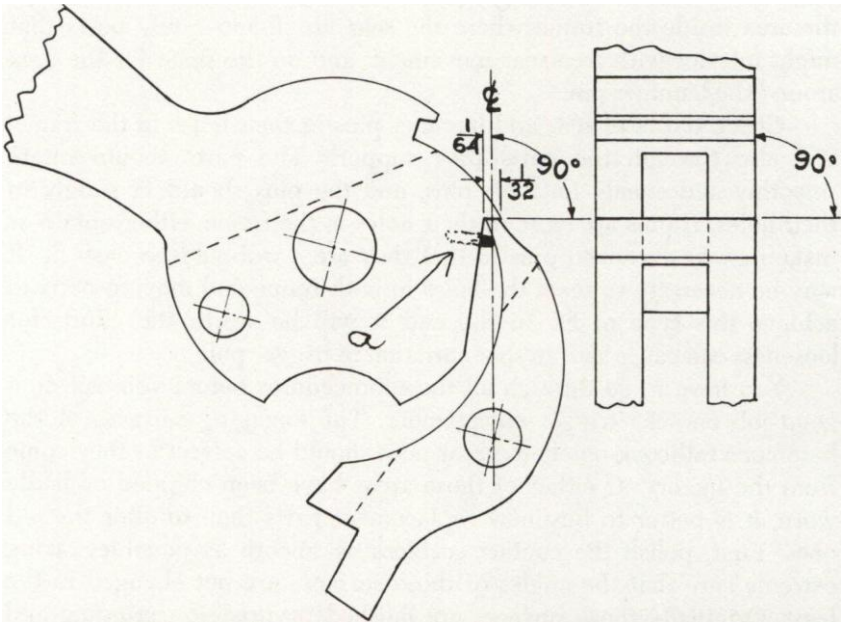
The next step is to relieve the front face of the hammer at the sear notch. This reduces depth of sear engagement and simplifies obtaining the lightest legal pull. A smoother pull may be obtained if the sides of the hammer are cut away on either side of the intercept notch (as Colt has done in its target models).

An alternative to reducing the depth of the sear notch is to drill a 3/6 4-inch hole in the hammer just behind the notch and drive a drill- rod pin into it, then grind or file the pin back until approximately 1/64 of an inch of sear engagement is produced.

About the last internal parts operation is to polish the rear of the sear carefully where it is engaged by the sear spring, and of course, polish the corresponding surface on the spring.

With all of this done, assemble all parts to the frame and check the feel and weight of the trigger pull. It should be smooth, crisp, and under five pounds. Further reduction in pull weight can be accomplished by bending the sear leaf and the trigger leaf of the spring slightly backward so they exert less pressure on those parts.

Pull weight may also be reduced slightly—and sometimes smoothness improved—by exerting substantial forward pressure on the hammer spur and pulling the trigger. The added pressure applied to the sear/hammer engaging surfaces irons out minor roughness.



Sear engagement on the ·45 auto can be regulated by inserting a drill-rod pin at (a), then filing pin back to secure minimum, adequate engagement without altering full-cock notch.

Pull weight may also be reduced somewhat by shortening the mainspring. Generally, two, three, or even four coils of the mainspring can be removed without producing weak ignition or misfires. However, this should be done cautiously and sparingly, as reduction in hammer impact reduces uniformity of firing-pin energy and this reduces ignition consistency—which in turn can produce velocity errors that cause vertical stringing.

If after all this you are not satisfied with the pull, it is simply a matter of refinement—that is, careful examination for any areas where further improvement in smoothness of operation may be obtained, and, perhaps a slight further reduction in sear engagement depth.

Even with all of the foregoing accomplished on the trigger pull, the venerable Browning mechanism will inherently produce a good bit of overtravel which some people find distracting. Some form of trigger stop is required to eliminate it. The simplest form of trigger stop is the installation of a trigger shoe containing a socket-head screw that may be adjusted to contact the frame at a point that barely allows the sear to clear the hammer. I prefer this system to the more sophisticated internal designs that require a great deal more work. Most common of the internal type is a socket-head screw threaded back through the face of the trigger to contact the magazine catch. In theory this type is quite good, and it is essentially the type used on Colt target models. However, its precise functioning is dependent upon a very close fit of the magazine catch in its hole in the frame—a closer fit than is usually encountered in most guns.

Making a sloppy or worn military catch fit snugly enough to insure uniform functioning of the trigger stop can be a chore. It is best accomplished by beginning with a new replacement catch, and if it is still loose, building up its outer surface by chrome plating until it is a hair oversized, and then polishing it down until it is a smooth slip fit in the hole. Then, the built-in trigger stop will function quite well.

An alternative built-in trigger stop consists of nothing more than a short screw threaded through the bottom of the trigger guard to bear against the lower rear surface of the trigger. It may be installed quickly and it is fully as effective as either of the other two types described. Its only disadvantage is that it must be removed before the trigger can be pulled out of the frame. Since target shooters avoid unnecessary disassembly like the plague, this can hardly be considered a serious defect. If I were to decide today to build up a new ·45 Match gun, this is the type of trigger stop I would use.

There is one factor which might affect trigger pull and it is often overlooked by the amateur pistolsmith—the manual safety. It functions by raising a projection that blocks rotation of the sear and prevents releasing the hammer. Some safeties are quite rough and may have burrs which rub on the sear, even when disengaged. These burrs aren't sufficient to prevent firing, but can make the trigger pull rough and draggy. Your best bet is to smoke the inner edges of the safety, assemble it after the trigger pull work is done, and then look for any point where the sear rubs soot away from the safety while it is disengaged. Deburring solves any problems that might exist. This operation is especially important if you happen to be installing one of the privately made combat safeties that generally require hand fitting for proper functioning.

While it is rare, you might encounter a grip safety that overhangs the sear enough to cause some drag, even when it is fully depressed. This, too, will interfere with a good trigger pull. If it occurs, simply take needle files to the safety and remove the offending area. Don't overdo it, though, or you might wind up with a nonfunctioning safety.

With mechanical accuracy and trigger pull taken care of, precise, fully adjustable target sights are the next consideration. Since a detailed discussion of their installation is in another chapter of this book, you are referred there for the details. The same may be said for fitting or making custom grips.

THE GROUP-GRIPPER

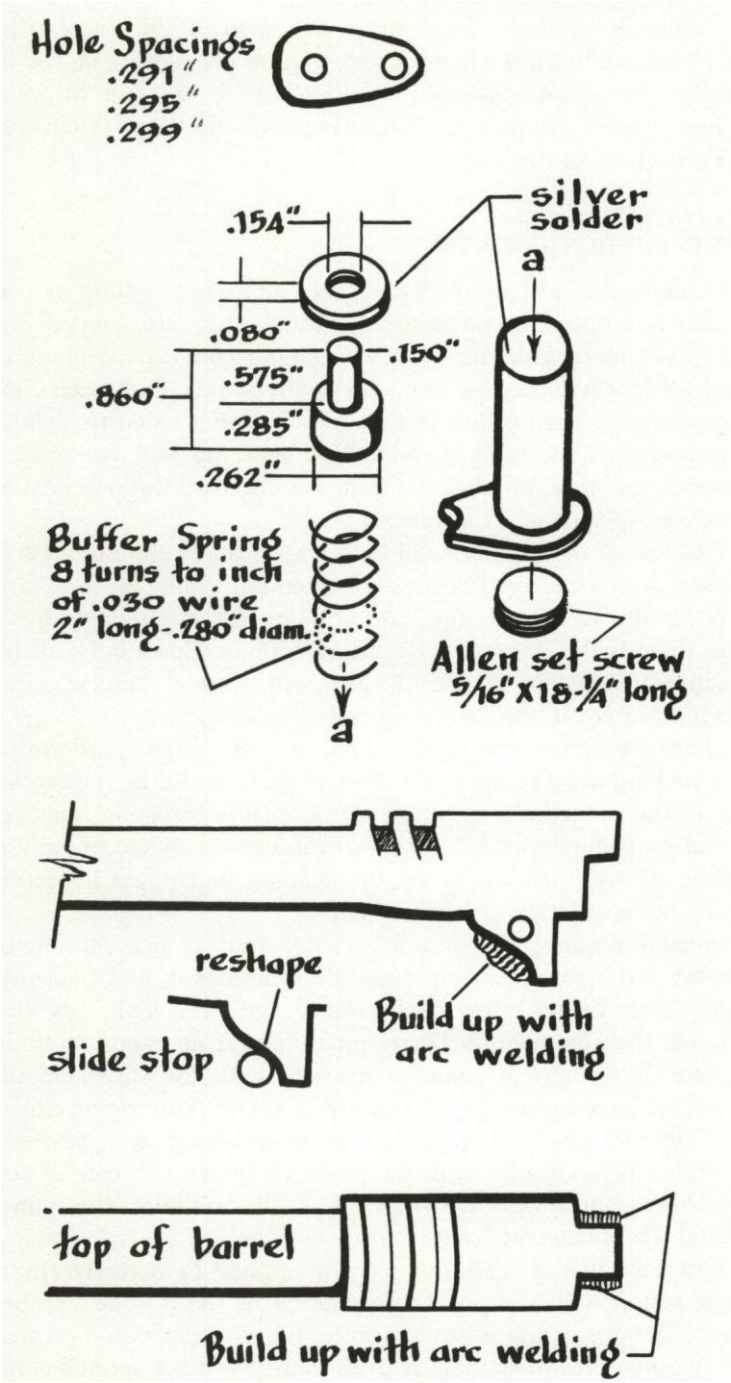
Many shooters object to the recoil of full-charge ·45 ACP loads, and feel that this sharp recoil strains various parts and reduces the number of rounds that a gun will deliver with top accuracy. This seems logical enough, but I've never had any particular problem with it. Actually, there's more gun to gun variation in accuracy life than any improvement therein that can be obtained by reducing recoil. Nevertheless, there are several recoil buffers on the market that may be installed without any alteration to the gun. Further, there is one buffer design that combines with a specially shaped barrel link to exert upward pressure on the barrel and improve its seating in the slide roof. It's known as a Group-Gripper and it is supplied by Dan Dwyer.

A buffer is installed by substituting it in place of the standard recoil-spring guide. It contains a heavy, internal coil spring backing a plunger that extends forward to contact the inside of the end of the recoil-spring plug. When the gun is fired the slide moves back, compressing the standard recoil spring, but at a point about two-thirds to three-quarters of the way through this travel, the buffer plunger strikes the inside of the recoil-spring plunger and the added resistance of its backing spring reduces recoil velocity and the amount of energy transmitted to the frame as the slide is brought to a stop. This additional spring force accelerates the slide forward more rapidly than the unaided recoil spring and can improve feeding by making more energy available for stripping cartridges from the magazine.

While apparent recoil reduction is a highly subjective matter, many shooters assure me that they find the big ·45 auto much more comfortable, in rapid fire particularly, after a recoil buffer is installed. Personally, I find the difference barely discernible, but as I said, this is a highly subjective matter.

IMPROVEMENT FOR RAPID FIRE

One last touch may be added to an accurized gun and it is often considered invaluable in improving control during rapid fire. This consists of roughening front and back straps by either stipling, checkering, serrating, or covering them with an abrasive or high-friction material. Simplest, of course, is to simply wrap abrasive cloth or pebble-grain rubber sheet around the front strap and secure it in place with the grips. Combined with the factory serrations or checkering on the backstrap, this provides a considerably better hold on the gun. Stippling is next best, and it, as well as checkering and serrating, is covered in detail elsewhere in this volume.



Above, top, is rough outline and hole spacings to make up your own long link from flat tool steel. Middle is simple modification of existing recoil spring guide to form an effective recoil buffer. Bottom, above, shows two areas of existing ·45 auto (·38 Super, 9mm) which may be built up and reshaped to reduce vertical and lateral barrel movement in slide to improve accuracy.

OTHER IMPROVEMENTS

Various other alterations which may improve handling or control may also be applied to target guns, though they are generally more closely associated with the so-called combat conversions of guns intended for law enforcement use. These alterations, too, receive extensive coverage in the portion of this book devoted to customizing and combat conversions. Look through that material and you may well discover some other modification that may increase the practical accuracy of your mechanically accurized ·45.

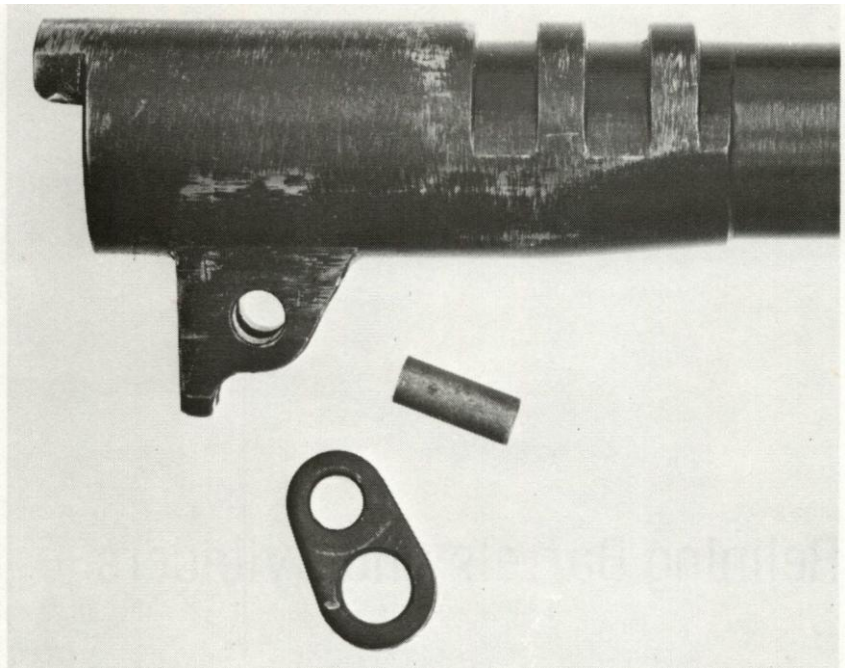
Whereas at one time the ·45 auto was virtually the only autoloading pistol which received accurizing attention, today we find a good deal of interest in several other large-caliber pistols. Probably foremost among them is the Browning High-Power 9mm. Essentially, all of the procedures applicable to the ·45 auto will produce similar improvements in accuracy in the Browning and other designs.

There are differences, of course, such as the permanently installed barrel bushing to be found in the Browning. It would be impractical to cover all the procedures necessary to adopt the foregoing methods to different guns, however, I feel that anyone who can successfully complete the ·45 work can easily see the changes that might be necessary when he has a different gun before him.

In the Browning, for example, it's necessary to make a new bushing insert and open up the slide muzzle to accept it, and then press it in place after fitting it to the barrel, as with the Colt. Also in the Browning, the absence of a barrel link makes it necessary to build up the barrel lug where it comes in contact with the slide-stop pin to position the barrel proper in the roof of the slide. The trigger linkage is quite different, however, reducing friction and eliminating wasted motion applies here equally, and the means by which this can be accomplished are readily evident when one disassembles the gun and examines the movements of its parts.

The same line of reasoning may be applied to virtually any autoloading pistol, with the possible exception of the unique Parabellum (Luger) design, and to a lesser degree, the Walther P38. Fortunately, these two models are seldom, if ever, considered for serious competitive use and there is no particular need to accurize them. On the other hand, the Star, the Llama, the Ballester-Molina, the Radom, and most other designs which you might want to accurize will respond readily to the procedures already outlined.

Admittedly, it may take a couple weeks of all the evenings you can steal from your family to accurize your pet autoloader. Nevertheless, if you're a careful workman, the results will be well worthwhile.



Close fit of link and link pin is essential to good accuracy; slide stop pin must also fit closely in the bottom link hole.

CHAPTER 25 - Relining Barrels and Cylinders

There are thousands of large-caliber, autoloading pistols which are in perfectly serviceable condition except that their bores are completely ruined, principally from the use of corrosive-primed wartime ammunition and subsequent failure to clean them properly. I have seen hundreds of like-new WW II military pistols which had been fired only a few times and then laid aside uncleaned, thus allowing the hygroscopic primer residue to suck moisture from the air and rust the bores so heavily that the rifling was obliterated.

With a few exceptions, replacement barrels for these now obsolete guns are unobtainable—the only source being firms that specialize in cannibalizing obsolete guns for their parts and those few shops that have tooled up to produce new replacements. Cannibalized barrels are better than nothing, but often their condition is mediocre and their price too high.

Newly manufactured barrels are fine, if well made and properly dimensioned (some are not), but they are generally costly and their use destroys the 100-percent originality that many handgunners prefer. After all, an Astra M400 rebarrelled with a modern, roughly finished tube turned out by Ace Screw Machine Shop and devoid of proof, caliber, or other markings can't really be considered an authentic piece. It may shoot great, but it isn't a completely original Spanish Astra.

The most logical solution to the ruined barrel problem is to reline it with a freshly rifled, thin-walled tube made of good barrel steel. Even when a replacement barrel might be available relining is often more economical. When the originality of the gun must be retained for one reason or another, relining is preferable to replacement, even if it costs more.

While relining is generally used to restore a barrel in its original caliber, this is not always the case. For example, the very thin walls of the ·45 ACP Colt barrel make relining difficult in the same caliber. By the time the original bore and chamber are reamed out sufficiently to accept a substantial liner, the original barrel has become quite a thin and relatively fragile shell. Consequently, it is usually simpler to replace this barrel than to reline it—except when relining to a smaller caliber, such as 9mm or ·38. Fortunately, most other big-bore autos have barrels thick enough to permit relining in their original caliber. Virtually all 9mm and ·30 autos have quite thick barrels and relining to original caliber presents no problems whatsoever.

In rehabilitating a barrel, it is often desirable to reduce its caliber. By choosing a liner of the proper bore dimension, this may be readily accomplished at no greater effort than retaining the original caliber. In fact, it generally produces a stronger barrel that is more capable of withstanding high pressure loads than the original.

Two approaches may be taken to relining. If you have an accurate lathe and the necessary drills, cutters and reamers, you may do the job yourself. Or, you may remove the original barrel and forward it to one of the relining specialists, who will do the complete job (for a nominal fee) and return it to you. Frankly, the second approach is by far the simplest and least costly, and it eliminates the need for a large assortment of expensive tools.

Relining sources are listed in the appendices, however, I have for several years been utilizing the services of David Woodruff, and without exception the barrels that he has relined are of excellent workmanship and have performed perfectly.

TYPICAL WORK—RELINING A 9MM BROWNING HP

However, assuming that you prefer to do the job yourself, let's examine two typical jobs—a 9mm Browning High-Power barrel re-lined to the original caliber, and a Colt ·45 Government Model barrel relined to ·38 Super or 9mm caliber.

The Browning barrel first. Chuck the barrel in your lathe and make certain it is running true—that is, true about the center-line of the bore. Main barrel outside diameter is approximately ·500-inch, and groove diameter is a nominal ·355-inch. Therefore, we must open the bore to approximately ·425-inch diameter, making room for a liner of approximately the same wall thickness (about ·035″) as the remaining wall of the barrel.

The best method of doing this is to first run through a piloted drill (pilot running on top of the lands) to open up the bore to about ·005 of an inch less than the desired final diameter. Feed the drill in slowly, use plenty of coolant/lubricant, and clean out the chips frequently. Once this hole is complete, exchange the piloted drill for a piloted reamer and, while using comparable caution, finish-ream the hole to final size.

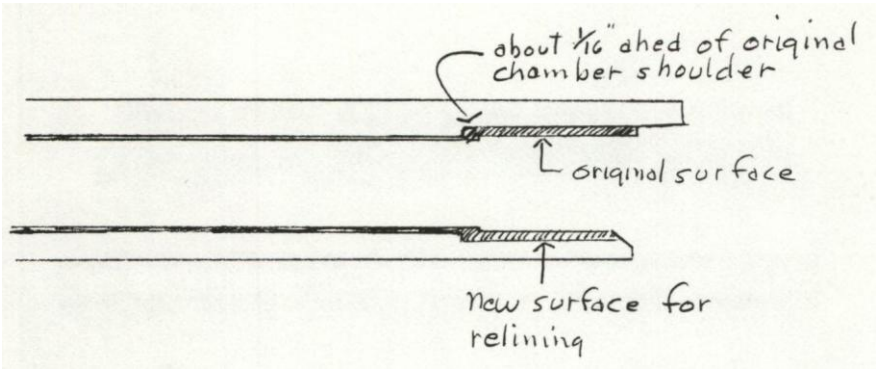
Next, the chamber counterbore must be cut to accept the enlarged chamber portion of the new liner. This, too, can be cut in two stages, first with a piloted drill and finished with a piloted reamer similar to a chambering reamer. The front shoulder of this counterbore should be at least 1/16 of an inch forward of the front end of the new chamber that will be cut. However, it should not be so far forward that the counterbore will weaken the original barrel shell in the area where its diameter is reduced ahead of the chamber.

The location and dimensions shown in the sketch have proven to be quite satisfactory for all Browning-type autoloader barrels. Keep in mind that it is the relative position of the barrel shoulder, liner shoulder and chamber mouth that is most important rather than specific dimensions.

Now, recheck the dimensions of the bore and chamber counterbore in the original barrel and on the lathe carefully turn a liner about ·002 of an inch undersize, making it long enough to extend about 1/16 to 1/8 of an inch at both muzzle and chamber. For 9mm, this liner should be turned from a standard 9mm barrel blank with ·355-inch groove diameter, ·348-inch bore diameter, and a twist of at least one turn in 16 inches.

The reamed inner barrel surface should not be polished, but should be left just as it was produced by the reaming operation. The surface of the liner should be cleaned by a light finishing cut and should not be polished. The slight roughness of the surface aids in obtaining a good bond between it and the original tube.

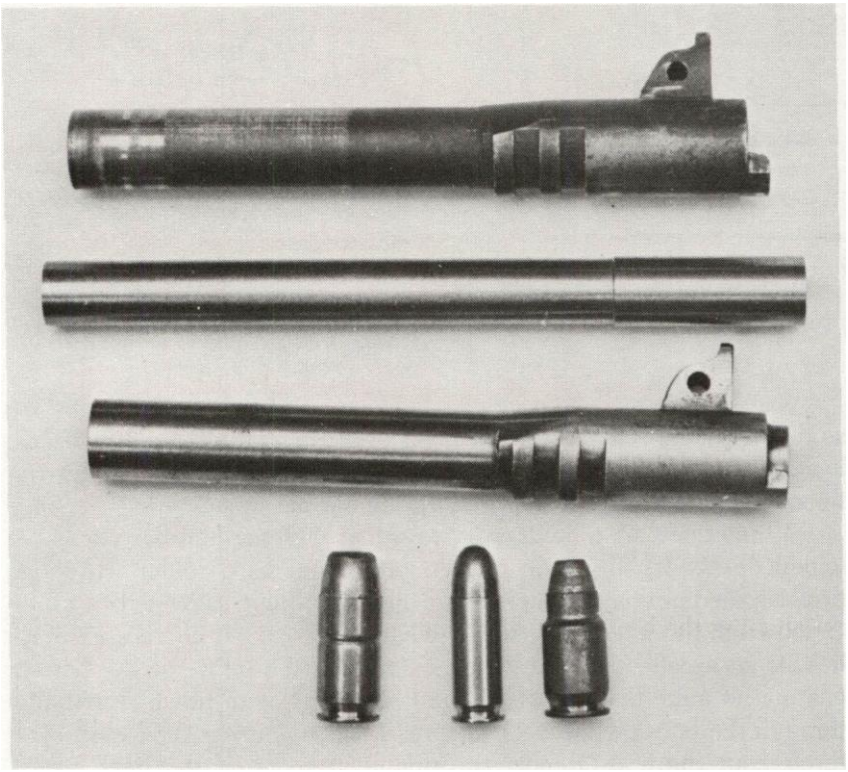
Make a trial fit of the liner in the barrel. It should be loose enough so that it can be fully seated by finger pressure, yet without any excess looseness at all. If the liner doesn't enter the barrel freely, either reduce its diameter slightly or open up the barrel.



While there are a number of ways that the liner and barrel can be joined (press fit, shrink fit, epoxy, soft solder, hard solder, etc.) we prefer a medium-hard solder filling the entire joint. Brownell's Fusion G-450 High Strength Alloy solder which melts at 450 degrees Fahrenheit, is an excellent choice. Begin by tinning the inside of the barrel, heating no more than necessary, and running a wire brush repeatedly through the bore (while hot) to spread the solder in a thin, even coat throughout the hole. Repeat the tinning process on the liner, using both a flame and a curved soldering copper to obtain thorough tinning coverage on its outer surface. During the tinning operation, the liner may be supported on a mandrel held in the vise, and the barrel may be supported in a split fixture.

Now, clamp the barrel lightly but firmly in the same fixture and insert the muzzle of the liner in the chamber end. Apply heat to both barrel and liner with a torch, keeping a lead hammer handy to tap the finer into the barrel as the solder begins to flow. When the solder is molten full length of the barrel and liner, only a few light taps are required to seat the liner solidly its full length in the barrel. Maintain heat until you're absolutely certain that the shoulder on the liner is seated solidly on the shoulder within the barrel.

Once the assembly is cold, saw off the liner length protruding from the muzzle and carefully dress and crown the liner flush with the original muzzle. If this is carefully done, the liner will be barely visible, indicated only by a very thin line of solder exposed between barrel and liner.



Top ·45 Government Model barrel has been bored out to accept the 9mm liner below it, and the bottom barrel has already been relined, with the liner trimmed flush with the muzzle, and the barrel tang, but not yet breeched. This allows conversion from the ·45 cartridge at left to the ·38 Super (center) or ·38- 45 Wildcat, or any one of several 9mm cartridges.

The barrel breech requires more care and attention. I prefer to first cut the protruding liner back only flush with the barrel tang, then rechamber, and, as a last step, cut away the remaining portion of the liner flush with the original barrel breech and reshape the feed ramp. Not everyone will agree with this procedure. It will often allow slightly tighter breeching-up and better enclosure of the cartridge case head by removing only those portions of the protruding liner as necessary for the gun to breech up solidly on a cartridge. You may also eliminate much of the built-in slop around the case head that is found in many military arms.

Once the liner has been cut back, the chamber cut, and the barrel fitted back into the gun, the chamber mouth and feed ramp should be given all the attention outlined in other portions of this book on the topics of improving feeding and functional reliability.

RELINING THE ·45 ACP TO ·38 OR 9MM

Relining a ·45 ACP barrel to ·38 or 9mm differs only in that the original barrel needs to be reamed out only sufficiently to completely remove the original rifling, and then counterbored only enough to remove the original chamber and to advance the shoulder for the liner shoulder to the proper relative position. Thus, the original barrel retains a much thicker wall and is less likely to be damaged. In combination with the much thicker walls, it produces a stronger final assembly.

When relining to a smaller caliber, it may be necessary to build up the original feed ramp directly below the breech end of the liner by carefully hard-soldering thin steel stock in place and then grinding or filing it to shape. The reason for this is that the angle of the original ·45- caliber feed ramp will, if carried on through the new liner, cut too deeply into the underside of the chamber, leaving an unsupported area of the case wall which might blow out under high pressure loads.

Relining those auto pistols whose barrels are integral parts of the barrel extensions or top receivers (as in the military Mauser M1896) is identical, except that more difficulty will be encountered in chucking and aligning the barrel properly, and that long-shank drills and reamers must be used to reach through the barrel extension. This type also requires careful finishing of the breech end of the liner, inasmuch as it will be more or less inaccessible, once it is seated, for finishing headspace or making extractor cuts.

Regardless of the type barrel, care should be exercised throughout the relining process to avoid defacing the markings or damaging the original finish. Of course, if refinishing is in order, that's another matter. After all work is done, any excess solder at the breech should be carefully removed with scrapers and wire brushes, and the outside should first be cleaned with solvent and then lightly wire brushed and burnished to a dull sheen without removing original finish.

RELINING REVOLVER BARRELS

Revolver barrels may be relined for the same purposes mentioned earlier, but in the past they have received far less attention than autos. Doing the barrel alone presents no more problem than an auto except that those non-concentric barrel designs may require a special holding fixture and a steady rest on the threads to run true in the lathe. Since there is no original chamber to remove in a revolver barrel, only a slight, short shoulder on the liner and a corresponding counterbore is required to mechanically fix the position of the liner in the barrel.

In fact, some relining smiths use no shoulder at all in revolvers and depend purely upon the solder bond to hold the liner solidly in place. In the average revolver caliber, this is entirely adequate, and it is probably adequate in the Magnum calibers. However, I much prefer a shallow shoulder and counterbore at the rear.

Often a revolver in need of relining may have developed excessive barrel/cylinder gap, and the barrel breech and cylinder face may be roughened and pitted from use or neglect. When this occurs, the condition may easily be corrected by adding a barrel-shank-diameter shoulder at the rear of the liner and establishing a new barrel/cylinder gap from it.

To do this, the front of the cylinder should first be carefully faced off and polished smooth to remove pitting or surface irregularities. Then, the rear face of the original barrel should be cut forward slightly, after which the liner is made up with a shoulder sufficient to completely fill the barrel/cylinder gap, plus about ·005 of an inch for final hand fitting.

After this, the liner is fixed in the barrel as outlined earlier, and the relined barrel is then refitted to the frame and cylinder, just like a new replacement barrel, to a minimum gap. The procedures for this are described elsewhere under refurbishing revolvers.

If a barrel is relined in its original caliber, and if the cylinder is in first-class condition, then nothing further needs to be done. On the other hand, if a reduction in caliber is being accomplished, or if the chamber throats are bad, relining or bushing the chambers is required.

In the medium and large-frame revolvers of relatively small caliber (·38 or ·357), chambers can be relined to the original caliber. However, in the larger bores such as ·44 and ·45, the chamber walls are generally so thin that it is impractical—if not impossible—to reline to the original caliber.

Assuming that you'll be relining to a smaller caliber, this is the way to go.

Be sure that your drill press does not have more than ·001-inch chuck runout, and make an arbor that is a slip fit in the cylinder chamber. Chuck this arbor in the press and use it to align the cylinder precisely with the spindle and clamp the cylinder solidly in that position on the drill press table. Then, with a drill bit of only a very few thousandths of an inch over maximum chamber diameter, drill slowly and carefully completely through, converting the chamber to a cylindrical hole.

Repeat this until all chambers have been opened up. Next, unless the cylinder you're working on is already counterbored to enclose the case-head rims, cut a shallow counterbore to mechanically position the liners.

Using round steel bar stock containing a hole of the proper diameter for the throat diameter of the cartridge for which the liners will be chambered, turn up a set of liners to a slip fit in the bored out chambers. Turn a small flange at the rear of these liners to seat in the counterbore, leaving about 1/16 of an inch excess at the other end for finishing.

These liners are then installed in the cylinder in exactly the same manner as liners are installed in barrels. Then they are carefully faced off front and rear, flush with the original cylinder surfaces, and polished and deburred.

Following this, it will be necessary to chuck the cylinder in the lathe and carefully turn off those portions of the liners that intrude into the original extractor/ejector recess. Generally, this means removing all metal inside the circle subscribed by the centers of the chambers and down to the depth of the original extractor recess. After it is accomplished, the chamber mouths and the cut areas should be carefully deburred and lightly polished.

Finishing the job requires a new extractor for the new caliber to be fitted, or that the old extractor be built up so that it will engage the new case rim properly. I once converted a badly abused S&W ·455 caliber triple-lock revolver to ·38 Special and a new extractor was made for it by simply turning off the prongs of the original, and then silver-soldering a ring of steel of equal thickness and full diameter of the cutout, after which notches were filed to roughly correspond with the inside diameter of the chamber bushings. The extractor was then finished by clamping it in place while the chambers were cut. The chamber reamer then profiled the extractor precisely.

Using the foregoing processes, many fine, old, black-powder or early smokeless-powder revolvers may be restored to service—in either their original calibers or more modern chamberings.

Reboring is another method of providing a like-new inner barrel surface. It is generally not possible in auto pistols except those with unusually thick barrel walls chambered for the 7·62, 7·63, or 7·65mm bottlenecked cartridges upon which a larger 9mm or ·38 cartridge is based with the same head dimensions. As far as autos are concerned, reboring is generally practical only in the Parabellum (Luger) and Mauser M1896 pistols chambered for the bottlenecked cases.

Much the same condition obtains in revolvers. The bigger ·44 and ·45 revolvers may seldom be rebored as a practical matter. Certainly there is no larger caliber than ·45, so enlargement of it is out, regardless of barrel thickness. In ·44 caliber, if the bore is not so deeply pitted and eroded that reboring to ·45 caliber will not clean it up, then the ·44 may be rebored to ·45 and the cylinder rechambered accordingly. Where large-frame guns are chambered for smaller calibers, it is usually possible to rebore to one or more larger calibers. For example, the old Colt New Service and S&W N-frame guns in ·38 and ·357 caliber may be readily rebored and rechambered to ·41, ·44, and sometimes (depending upon barrel diameter) to ·45 calibers. Older ·41 Colt, ·38-40, and various ·44s can usually be rebored at least one caliber upward.

While a well-equipped home pistolsmith may very well accomplish the rechambering and relining mentioned, reboring is beyond the capabilities of anyone not equipped with deep-hole drilling and reaming and rifling equipment.

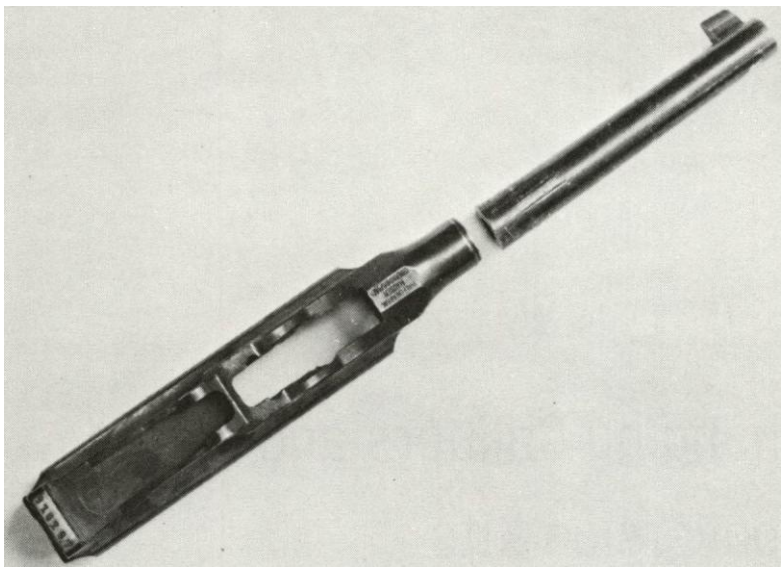
The accompanying cylinder work is not at all difficult and is handled in exactly the same manner as already described for chambering relined or bushed revolver cylinders.

A mandrel which will fit closely in the chamber throat is made up and utilized to accurately align the cylinder, which is then clamped to the drill press table. Following that, a slightly undersize drill is used to open up the original chamber and throat followed by careful reaming to the correct throat diameter of the new caliber. As a finishing operation, a standard chambering reamer is used to rechamber the altered cylinder. In this instance of going from a small to a larger caliber, the original extractor star is left in place throughout, and the act of chambering automatically cuts it to the proper profile. Where the original cylinder has been counterbored to enclose the case head of its original caliber, one must use a chambering reamer designed to cut a similar counterbore for the new caliber, or else cut the counterbore separately with whatever tool suits your inclination.

AN ALTERNATIVE FOR THE M1896 MAUSER

Though it was mentioned that reboring and relining may be performed on the M1896 Mauser with its integral barrel/barrel extension design, there is a practical alternative to obtaining a new bore surface if one can accept a completely new barrel forward of the barrel extension or receiver.

This is accomplished by sawing off the original barrel at the point shown, and then boring out and threading the front end of the remaining barrel extension in conventional fashion. After this, it is simply a matter of turning a threaded replacement barrel from an existing blank, screwing it into the altered extension, and then fitting and chambering. This is not a particularly new or unusual method of refurbishing the M96 Mauser, for it was used around the end of WW I in Germany to fit 9mm Parabellum barrels to existing 7·63mm Mauser pistols. Pistols so converted are now scarce collector's items. As a matter of fact, inasmuch as modern replacement Parabellum barrels are now readily available at reasonable prices, it would be entirely practical to saw off the old Mauser barrel and thread the altered extension to accept a Parabellum barrel. Why not?



Solid barrel/barrel-extension units such as this Mauser M96 may be cut as shown, then threaded for a conventional replacement barrel.

As can be readily seen from the foregoing, there is no longer any legitimate excuse for retiring an obsolete handgun simply because its bore is no longer shootable or accurate. Relining or reboring may be utilized to restore virtually any handgun to shooting condition insofar as the bore and chamber are concerned.

CHAPTER 26 - Changing Calibers and Conversion Kits

Over the years various kits or accessories have been manufactured to convert handguns to calibers other than those for which originally manufactured. Notable and most familiar among these is the still available Colt ·22 Conversion Unit. It consists of a separate slide, barrel, recoil spring, and magazine which are simply substituted for the same ·45 caliber parts on the Colt Government Model to adapt it to normal functioning with the ·22 Long Rifle cartridge. Another currently manufactured in 9mm Parabellum caliber, but offered with replacement barrel and recoil spring in 7·65mm Parabellum (·30 Luger) and replacement slide, barrel, recoil spring magazine in ·22 LR caliber is the SIG P. 210. Similar conversion units have been manufactured for the Walther P-38 and some other autoloading pistols. In addition, ·22 LR conversion units, consisting of replacement cylinder and removable barrel insert were once manufactured for the British ·455 caliber Webley Service revolver.

The availability of such conversion units and the fact that many auto pistols are produced in assorted calibers with little apparent mechanical change has lead many shooters to wish, for example, for a means to convert a ·45 pistol to ·38, 9mm, 7·65mm, or other caliber. Even where kits or factory conversion parts are not available, this presents no particular problem to the amateur pistolsmith.

Generally these conversions are quite simple, and two that I have performed on the S&W M39/59 pistols illustrate the point. Though chambered only for the 9mm P cartridge, these guns have sufficient length of magazine and recoil travel to handle the longer ·38 Super case loaded to an overall length of no more than 1·150 inches, which is possible with expanding bullets in the 90 to 100-grain range. Consequently, a high performance loading of the ·38 Super case has been developed, utilizing the 90-grain Super Vel JHP bullet at velocities from 1600 to 1700 fps—making it a very effective defense load.

S&W 39-CONVERSION TO ·38 SUPER

Conversion of the M39 to handle this load requires mainly that the original chamber be deepened to a nominal length of ·898- ·900 inch. While a standard ·38 Super chambering reamer can be used for this purpose, the minimal headspacing engagement provided by the very narrow Super rim and barrel tang does not perform as well as it should. Consequently, a special reamer should be used, containing all the standard dimensions of the ·38 Super case but shaped to cut a square shoulder at the front of the chamber against which the case mouth seats to regulate headspace after the fashion of the 9mm P and ·45 ACP. When the standard 9mm M39 barrel is rechambered in this fashion, and the gun receives the usual high performance ammunition tuning mentioned elsewhere in this volume, it will function perfectly with the short-loaded ·38 Super cartridge.

It is acknowledged that the S&W 9mm chamber is somewhat slightly larger in diameter at the mouth than is standard for the ·38 Super—however, in firing many thousands of rounds loaded to pressures in the 30-35,000 psi range, no difficulties have been encountered other than slightly excessive expansion just ahead of the web. No case failures have resulted, and good quality brass takes this in stride.

S&W 39—CONVERSION TO ·380 ACP

Though there is little valid reason for it, the S&W M39 has also been converted to ·380 ACP caliber. This involves mainly boring out the chamber, pressing a steel bushing in place, and then rechambering the bushing to standard ·380 ACP dimensions. This ·380 ACP conversion of the M39 or other 9mm pistol also generally requires some weakening of the recoil spring. This is done by clipping off one coil at a time, then stretching the spring back to its original uncut length, and test firing, until proper functioning is obtained.

CONVERTING SPANISH PISTOLS TO 9MM P.

A more popular conversion consists of adapting the various Spanish pistols chambered for the 9mm Bergmann-Bayard Long (9mm Largo) cartridge to handle the more plentiful and more economical 9mm P. The original 9mm B-B chamber is of slightly smaller mouth diameter, less tapered, and approximately ·150 inch longer than the 9mm P. While the entire chamber can be bored out, bushed, and the bushing rechambered, a much simpler and more economical approach is the use of a chamber-insert bushing which simply fills up the forward portion of the original chamber and provides a properly located headspacing shoulder for the shorter 9mm P case. For this purpose a tool steel bushing with an OD of ·378 inch*, an ID of ·356 inch, and a length of ·150 inch is turned on a lathe and then driven into the front of the B-B chamber to seat solidly upon the original headspacing shoulder. Generally, the slightly smaller mouth diameter of the original chamber will accept standard 9mm P cases, however, if it does not, only a small amount of polishing is necessary to enlarge it to the point where it will.

* Or large enough to be a tight press fit in the front of the chamber.

A bushing of the dimensions just given will normally provide proper functioning and reasonably accurate headspacing of the 9mm P case. In fact, I have not known of an instance when it would not. However, if one prefers more precise control over headspace dimensions, simply make the bushing a few thousandths of an inch longer, then after it is seated run a 9mm P chambering reamer in until the headspace is established at ·760 inch. Thousands of Llama, Star, and Astra pistols originally made in 9mm Bergmann-Bayard caliber have been converted to 9mm Parabellum in this general fashion and have given thoroughly reliable and accurate service.

It is a simple and very economical method of modifying guns to a more desirable caliber, and while it has been said that the additional free bullet travel or "freebore" introduced by the bushing and shorter case should have a deleterious effect upon accuracy, in practice no such effect can be seen. From time to time in the past, various shops have offered the conversion bushing for sale at very nominal cost.

While ideally the bushing should be made on a lathe or Unimat, it is possible to make it on a drill press. This involves first drilling and reaming the inner diameter, then pressing the proper length stock over a mandrel chucked in the drill press, and finishing by filing to the correct OD as the piece is rotated. Not as neat or as quick, perhaps, as a lathe, but if you're careful it will produce a perfectly satisfactory bushing.

Generally speaking, any autoloader may be converted to any other cartridge of similar design that will feed through the magazine and feed system and which is or can be loaded to the working pressures and recoil impulse for which the gun was designed. For reliable functioning of such a conversion, it is quite essential that the new cartridge be loaded to produce recoil energy above the minimum level for which the gun was designed.

OTHER CONVERSIONS TO 9MM P.

Often one will encounter a gun whose bore is ruined or for which ammunition is no longer available. Depending upon the circumstances and specific dimensions involved, it is usually as easy to convert such gun to a new caliber as to repair it. The new bullet diameter must be sufficiently large to allow reboring of the original barrel and yet not too large for the existing barrel diameter.

The classic example of this is the conversion of 7·65mm P. (·30 Luger) pistols to 9mm P caliber. In the case of Parabellum pistols, this is accomplished by merely reboring the barrel to 9mm specifications and rechambering. Since the gun was designed around both calibers, no other modifications are necessary, not even in the magazine or recoil spring. The 9mm case is long enough that rechambering cleans up the bottleneck 7·65mm chamber and leaves a proper headspacing shoulder. A similar conversion may be accomplished on the 7·63mm Mauser M1896 pistol by reboring and rechambering to 9mm Mauser or ·38 Super. In this case, the action and magazine are long enough to handle these longer 9mm/ ·38 cartridges, which the Parabellum is not. This same conversion may be carried out on the Soviet Tokarev TT M1933 pistol and the various satellite nation copies of it, as well as the unusual roller-locked Czechoslovakian M52. In some instances (depending upon the internal magazine dimensions), it is also possible to rebore and rechamber 7·65mm (·32 ACP) pistols to ·380 ACP caliber.

Another rather unusual conversion involves various Japanese 8mm Nambu pistols which are rebored to 9mm and then rechambered to the 9mm Parabellum cartridge. In these, the original chamber is slightly larger in diameter at its rear than is correct for the 9mm, but it tapers rather sharply and so cleans up to the correct dimensions elsewhere. The slight oversize condition at the rear produces no ill effects upon firing, other than a slight bulging of the case. This has not to my knowledge ever produced a gas leak or any damage to the gun or the shooter.

Guns chambered for the 9mm Steyr cartridge, mainly the M1912 Austrian Service pistol, may also be converted to 9mm P caliber by the use of a chamber insert bushing of the same dimensions as mentioned in regard to 9mm B-B pistols. On the other hand, this same model is sometimes encountered rebarreled or remanufactured in 9mm P caliber for German use during WW II—and when that occurs, it may be rechambered to accept the 9mm Steyr cartridge by means of the square shouldered ·38 Super reamer mentioned earlier in this chapter.

The M1896 Mauser and other guns (Tokarev, Czech M52, and certain scarce models of the Star) may also be rebored and rechambered to 9mm Parabellum, however, the shoulder of the 7·63mm Mauser/7·62mm Soviet chamber is too far forward to permit a full and correct headspacing shoulder for the 9mm P. Therefore, it is necessary to bore or ream out the shoulder area of the original chamber to a depth of ·900 inch from the breech face and use a chamber insert bushing as already described in converting 9mm Largo pistols to 9mm P.

OTHER CALIBER CONVERSION POSSIBILITIES

There are other caliber change possibilities through simply rechambering an existing good condition barrel. For example, the Colt Government Model or the Commander in 9mm caliber may be rechambered to ·38 Super with no other alterations required. The same two calibers in these models may also be rechambered to the ·357/ ·45 Wildcat, after which a ·45 magazine must be used and either the slide breech face opened up to ·45 caliber or a ·45 caliber slide installed.

THE VERSATILE GOV'T MODEL ·45 ACP COLT AND OTHERS

Caliber changes need not be dictated by necessity. Often it may be desired to simply increase a particular gun's versatility or to adapt it to a special use without destroying its initial capabilities. A classic example of this might well be a complete set I once assembled by means of which a single Colt Government Model frame could be set up in moments to handle ·22 LR, 7·65mm Parabellum, 9mm Parabellum, ·38 Super, a special ·41 rimless Wildcat, ·45 ACP, and ·38/ ·45.

An unusual conversion of the ·22 Ruger Standard Model auto to ·32 S&W Long (wadcutters only) for target use. Note massive weight added to bolt head to resist the ·32s greater recoil, and the new, heavier barrel. In addition, it was necessary to convert the bolt face from rimfire to center-fire, to open up the magazine well, and fabricate special magazine for the rimmed ·32 cartridge.

Beginning with a first-class Government Model, I first added a standard Colt ·22 Conversion Unit. This was followed by obtaining from the Whitney Sales Co. a special 7½ inch barrel chambered for the ·38/ ·45 Wildcat. Following this, a 9mm Parabellum slide was procured, and then a ·45 barrel was relined and rechambered to 9mm, and a 9mm magazine was added to complete the conversion unit. Next, another ·45 barrel was relined and chambered to ·38 Super, this being the only additional item required to add that caliber to the list because the 9mm slide and magazine functions equally well with either.

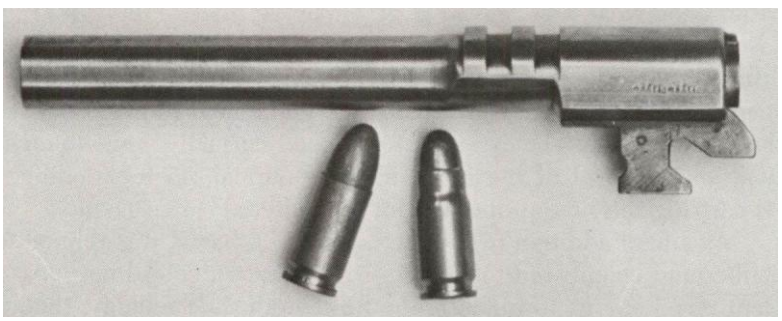
Another ·45 barrel was then relined and chambered to the specifications for what I called my "·41 Super" Wildcat (the ·41 Magnum case altered to rimless form and shortened to ·975 inch length) and fitted to the original ·45 slide by means of a rebuilt extractor and a specially designed removable cartridge guide held in place by a screw through the slide. The extractor functioned normally with ·45 ammunition, and removal of the guide allowed normal ·45 functioning. This ·41 cartridge also fed properly from an unaltered ·45 magazine.

As a final addition to the set, another ·45 barrel was relined to ·30 caliber and chambered to 7·65mm P. This cartridge did not have sufficient recoil energy to function the full length slide reliably, though, so a spare military ·45 slide (far more economical than a commercial 9mm slide which would have otherwise been required) was altered at the breech face to accept the smaller case head, and was then shortened to Commander length (as was the barrel) and its weight reduced by lightening cuts on sides and top. This reduction in weight, provided proper and reliable functioning with the 7·65mm cartridge utilizing the 9mm magazine, after a bit of trimming in the recoil spring.

The only other alteration required to accommodate the whole range of seven different calibers was adjustment of recoil spring force (several different springs being made up by clipping different amounts from originals) to suit the lighter calibers, and the fitting of a 9mm/ ·38 ejector to the frame and then widening the ejector slot of all the ·45 (originally) slides used with the set. As a result, I wound up with one frame, seven barrels, three magazines, and four slides in a single fitted case, and with this assortment of parts and components I could be set up in only a moment to shoot any one of two Wildcat or five standard factory calibers. And, as though that were not enough, by the addition of one more barrel (·38 Super rechambered) and one more magazine, I could have added the capability of also shooting the flush seated ·38 Special wadcutter load with the same outfit.

Since it is chambered for the largest autoloading pistol cartridge available, the Colt Government Model and its various copies are the most versatile when making up multiple caliber sets. However, the Parabellum, Mauser M1896, SIG, Tokarev, Browning HP, and a number of other service-type autoloaders can be modified to rapid change for a minimum of two and sometimes three calibers.

The Parabellum requires only the purchase of a new barrel and barrel extension, the Browning HP requires the relining of a spare barrel, the Mauser M1896 the same, the P. 38 purchase of a new barrel, and the others for which new barrels aren't readily available require the relining of a spare barrel. If one uses a little imagination, the possibilities are almost endless. At least they could keep you busy for years!



This Browning H-P barrel, of wartime manufacture, was originally in 9mm caliber but has been relined to ·30 and chambered to the 7·65mm Parabellum (Luger) cartridge (right, below). Note that liner has not yet been trimmed at the breech to fit the slide face.

There are countless thousands of Walther PP/PPK and Mauser HS pistols in this country which were produced during WW II in 7·65mm caliber. Popular and desirable though they may be in the original caliber, the current demand is oriented much more toward the ·380 ACP. Both models are available in new guns in this caliber, but the price is quite substantial.

In most instances, these three models can easily be converted to ·380 by simply purchasing a new ·380 barrel and installing it. Some wartime guns, depending upon the period of manufacture, will also require that the slide muzzle be opened up slightly to match the larger diameter of the ·380 barrel. And, usually those same guns will also require a new ·380 recoil spring. Generally speaking, wartime Walthers will accept early-production ·380 magazines which do not have the raised rib on the side as found on current-production magazines. If only current magazines are available, then a slot may be filed on the inside of the magazine well to accept that rib, after which the new magazine will function correctly. Also, most wartime 7·65mm Walther magazines will accept ·380 cartridges with at most a very slight amount of filing to increase cartridge clearance at the rear. Generally, even that is not required.

Hence, with at most the expense of a new barrel, recoil spring and magazine, an old gun in which very little if anything has been invested can be converted to comply with modern caliber thinking, and may require only a new barrel or merely reboring of the original barrel at even less cost. Likewise, should you be an enthusiast of the 7·65mm cartridge, it is equally practical to convert those same guns to it from ·380 caliber. In this instance it would be more economical to simply have the original barrel relined and rechambered.

REVOLVER CONVERSIONS

Converting a revolver to another caliber doesn't seem to have gotten as much publicity as doing the same with autoloaders, yet it is done quite often. An entirely new set of problems enters the picture, although none of them are particularly difficult to solve. Generally, the idea behind such alteration work is to give the piece a dual capability, that is, so it will fire more than one cartridge, or will allow substitution of some more readily-available or lower cost cartridge in place of one expensive or difficult to obtain.

Probably the first such conversion that came to my attention was that of altering assorted ·455 caliber British Service revolvers to accept the ·45 ACP U. S. Service cartridge. Colt, S&W, and Webley revolvers in ·455 became widely available in this country in the early 1950s, and I can remember when a like-new Webley might bring $14, and a Colt or S&W in similar condition could be purchased readily for $22. With all these fine guns available, it was unfortunate that the ·455 British ammunition was so unbelievably scarce. One might well be forced to pay as much for two fifty-round boxes of ammunition as for one of the Colt or S&W revolvers.

Such a situation was not tolerable to the handgun buffs in this country, and it was immediately determined that the ·45 ACP round would readily fit in the chamber, but could not be extracted for lack of a rim, and it could not be fired for lack of a headspacing shoulder. Back room gunsmiths immediately discovered the solution in turning approximately ·040 inch off the rear face of the cylinder and extractor, thus creating adequate headspace for the ·45 ACP cartridge in M1917 three-round, half-moon clips. Altered in this fashion, all three makes of guns functioned as did the U. S. M1917 revolvers with similarly clipped ammunition. In fact, the same S&W three-round clips were used. The clips provided both the means of extracting the empties and supporting the case for proper ignition.

While I personally deplore such work except as a last resort, it is quick, simple, and effective. Nevertheless, many of those altered in the 1950s were poorly executed, with wide variations in headspace and rough machining.

Assuming the gun is in good condition, one should first measure the headspace, averaging it by measuring at least four points on the cylinder, and then subtracting that measurement from ·090 inch to determine the amount that must actually be removed from the rear face of the cylinder. The ·090 inch dimension is the nominal headspace required for use with clipped ·45 ACP ammunition or the ·45 Auto- Rim cartridge manufactured specifically for use in those same guns.

Then, the cylinder must be carefully chucked in a lathe and with the extractor star in place, the rear of the cylinder is faced off an amount equal to the difference between measured headspace and desired M1917 headspace. The cut should be made progressively, and finished with a very light facing cut and light polishing. Be careful not to cut into the cylinder ratchet. Following that, the outer edge of the cylinder should be deburred or very lightly radiused. Mouths of chambers should also be deburred with a scraper, as should the edges of the extractor. Most 'smiths then simply pop the cylinder back into the gun, hand it to the customer, and send him on his way.

Unfortunately, the job isn't really completed at that point. At least, it should not be considered completed on the Colt or S&W ·455s. Both of those guns depend upon a lug at the lower left rear corner of the cylinder recess to hold the cylinder in its proper longitudinal relationship to the frame when the cylinder is open. Removing approximately ·040 inch from the rear face of the cylinder means that it is free to move that far rearward before contacting the lug, causing it to slap back and forth that amount, and allowing the lug to be damaged by extraction loads. The cylinder may even override the lug to jam and prevent closing the gun. Not a very good situation.

Colt revolvers depend upon a lug integral to the side plate, and to maintain proper fore and aft cylinder alignment, a ·040 inch thick steel shim is soldered to the front face of this stud. With care, soft-soldering will do the job without spoiling the original finish. If the gun is scheduled for refinishing anyway, it is better to have the front of the lug built up by welding and carefully filed back to proper shape and position. This is easily done without harming the frame, since the lug is in the removable side plate.

S&W guns present a different and more easily solved problem. The "frame lug" is cylindrical, with the front face flattened, and is simply pressed into a hole in the frame and riveted over from the inside. This lug can easily be driven out with a 1/16 inch punch from inside the frame, and replaced with the one made for the M1917 revolver. This part costs less than a dollar according to the last S&W list I looked at, and its replacement requires only a few moments. Just make certain that the front flat is aligned vertically, the lug is seated solidly against the frame, and that the inner end is riveted over lightly to secure it in place. Of course, if you are where you simply cannot obtain a replacement lug, remove the old one, solder or weld up its front face, dress it down to size and then re-install it. That way, there won't be any chance of spoiling the finish on the frame.

A less popular, but in my opinion more practical (and more pleasing, aesthetically), conversion of the ·455 Colt or S&W revolvers (not the Webley because of its shorter cylinder) consists simply of recutting the chambers to ·45 Long Colt. This involves first obtaining a ·45 Colt chambering reamer made with counterbore to cut a recess for the case rim. Proper headspace for the ·45 Colt is ·060 inch as opposed to ·045 inch for the ·455. By simply cutting a ·015 inch deep counterbore at the chamber mouth to accept the ·45 Colt rim, proper headspace is achieved without changing cylinder length or altering cylinder and lug relationship. Thus, the external appearance and relationship of the parts remain unchanged. So, with a chambering reamer made to also cut a rim counterbore at hand, the individual chambers are reamed deeper until the cylinder will accept standard ·45 Colt cartridges and allow a ·006-inch feeler gauge to be passed between the recoil shield and case head at every chamber. Procedure for the actual reaming of the chambers is described elsewhere in this volume.

Should it be desired, the same ·455 cylinder can be given the same treatment but in ·45 Auto-Rim caliber. The only reason I can think of for this conversion is that one might have available a goodly supply of ·45 A-R ammunition. In this instance it won't even be necessary to rechamber—the original ·455 chamber will accept the ·45 A-R cartridge, and all that prevents its chambering and functioning is the much thicker rim. All one needs do, then, is cut a ·040 inch deep counterbore ·520- ·525 inch diameter to accept the A-R rim deeply enough to permit free cylinder rotation and the ·006-inch clearance mentioned above. If in this conversion the A-R counterbores are cut to the minimum diameter that will accept the case rims, it will usually still be possible to obtain normal functioning of ·455 ammunition in the gun. This is possible because the ·455 case rim is ·525 inch in diameter, while the A-R is ·510- ·515 inch. Thus, even after counterboring, the ·455 rim will overhang the counterbore a bit and offer sufficient resistance for ignition and case extraction.

CONVERSIONS TO ·45 LONG COLT

Actually, these days I receive more requests for instructions on converting a ·45 ACP revolver to ·45 Long Colt than any other. Evidently, handgun enthusiasts not entirely familiar with the cartridge dimensions assume that since the ·455 can be converted to ·45 ACP or ·45 Long Colt, the ·45 ACP should be convertible to ·45 Colt. Unfortunately, it isn't all that easy.

Nominal headspace (distance between rear face of cylinder and front of recoil shield) for the ·45 ACP and thus all S&W and Colt revolvers chambered for it, is about ·090 inch. Headspace for the ·45 Long Colt is ·060 inch, substantially less. Thus, if the ·45 ACP chamber is opened up to accept the longer case, a condition of ·030 inch excess headspace will exist.

Despite that, if firing-pin protrusion is maximum, adequate primer ignition will usually be obtained and functioning will generally be normal. When the firing pin strikes the primer, it will first drive the case fully forward to the limit of the excess headspace, then detonate the primer, followed by the case being slammed back against the recoil shield by chamber pressure. So long as the brass is of good quality, chamber walls are smoothly cut, and excessive pressures are not generated, the fired case will then contract and be free to move slightly forward in the chamber and allow free cylinder rotation.

However, in the event of a short firing pin, weak mainspring, high chamber pressure, poor brass, etc., etc., functioning may well be poor with such a conversion. I generally recommend against it for that reason.

The alternative to a ·45 Colt conversion of a ·45 ACP revolver is first to obtain a contemporary military-surplus ·455 cylinder. The last time I checked, these cylinders were available for both Colt and S&W revolvers at fairly reasonable prices from several purveyors of obsolete parts. Where they could once be had in new condition for only $2 or $3, they now seem to bring much more, but I guess that is just one sad fact of life.

Assuming you've obtained a ·455 cylinder, simply cut back the frame lug so this slightly longer cylinder will fit, assemble and fit it to the gun, (checking timing, barrel cylinder gap, headspace, etc.) and then follow our previous conversion instructions from ·455 to ·45 Long Colt with counterbored case rims. Sometime, though, it may be that you cannot find a new ·455 cylinder—or even that you want to convert a late model M1950 or M1955 S&W to which those 1917-vintage ·455 cylinders cannot be fitted.

If it's the former, simply lack of a new cylinder for a 1917 gun, then you can carefully file to shape ·030 inch thick steel shim stock and carefully solder it to the rear face of the cylinder and the extractor star. This isn't as difficult as it might sound. For the cylinder, simply cut out a ring of shim stock with OD to match the cylinder face and ID to match the edge of the extractor cut. Then, solder in place on the rear face of the cylinder, and afterward carefully file away that portion of the ring which lays over each chamber mouth. Make a smaller ring and apply it to the rear face of the extractor star and file it to shape in the same way.

Actually, in these days of miracle adhesives, you can get by quite nicely without soldering. Very carefully clean the surfaces and fit the shim stock in place, then epoxy it solidly to the original surface.

The shim thickness given above will provide reasonably correct headspace for the ·45 Colt under most conditions. However, headspace should be checked as already outlined, and regulated as required. Then, too, after the shim is in place on the rear of the cylinder, the frame lug must be cut back a corresponding amount to allow the cylinder to align correctly. This same method can be applied to convert late model S&W ·45 ACP revolvers to ·45 Colt, but it seems terribly crude for one of those fine guns—worth upwards of $200 these days. Though it will work fine, it just won't look right.

Instead, obtain a replacement ·44 Magnum, ·44 Special, ·41 Magnum, ·38 Special, etc., cylinder for the same frame-size gun (N-frame) and rechamber it to ·45 Long Colt caliber as will be described a bit farther along. Then, cutting back the frame lug first, fit the rechambered cylinder to the original gun, and you'll have a ·45 Colt Conversion that looks fully original except for that bastardly ·45 ACP marking on the barrel.

CONVERSION ·38-200 TO ·38 SPECIAL

Another revolver caliber conversion was popular back in the 1950s. It was resorted to so as to make large quantities of surplus British military guns more saleable in this country. The guns in question were Colt and S&W models manufactured during WW II for the British military establishment in ·38/200 (·38 S&W) caliber. These guns were the standard Colt OP and S&W M&P models in various barrel lengths and military finishes. Otherwise they differed not a bit from the same models commercially made in ·38 Special caliber. Colt designated its guns "Commando", and S&W called its products "Victory Model", and some are so marked.

When these guns became available, the principal demand for guns of their size was in ·38 Special, so it was almost impossible to sell them in their original caliber at any reasonable price. Consequently, various importers and entrepreneurs simply obtained ·38 Special chambering reamers and ran them into the ·38/200 chambers, deepening them to accept the standard ·38 Special cartridges. Headspace for the two cartridges is nominally the same, so this presented no problems.

However, the ·38/200 chamber is generally about ·010- ·015 inch larger at the rear than a standard ·38 Special chamber. Thus, after the conversion, the chamber is funneled oversize for the ·38 Special at the rear. Generally this doesn't cause any harm except that fired cases show a substantial and somewhat eccentric bulge just ahead of the rim. Weak brass may crack or split and allow a small escape of gas at this point, and the same thing may occur with cases that have been reloaded many times. However, I have never heard of any injury to gun or shooter resulting from this.

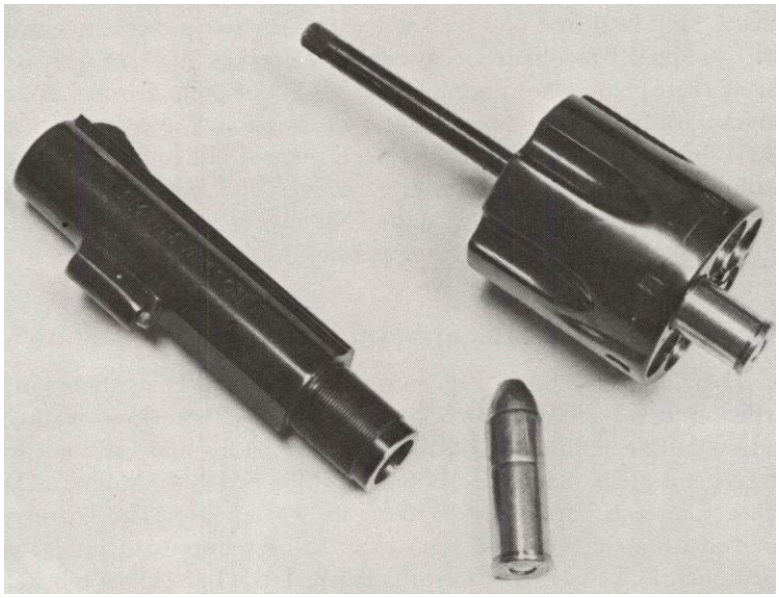
Essentially the same conversion in reverse has occurred a few times. I believe it first occurred when British troops, somehow armed with ·38 Special revolvers, occasionally reamed or filed a taper at the rear of their chambers to accept the ·38/200 or 9mm Parabellum cartridges with the rims dimpled to allow extraction. I also once ran into a S&W M&P whose chambers has been reamed out lightly at the rear to allow chambering of ·38 Super cartridges. If I remember correctly, this gun came up out of Mexico, and the owner at one time probably didn't have anything but ·38 Super ammunition available.

CONVERSION S&W M58 ·41 MAG. TO ·45 COLT

There are times when a given revolver may not be available in the particular revolver-type cartridge one wants. Recently I wanted a modern double-action ·45 Colt revolver very badly, and I did not want a converted older model. Eventually, a M58 S&W ·41 Magnum M&P with a four-inch barrel and fixed sights was chosen. The barrel was removed from this gun and sent away to be rebored to standard ·45 Colt dimensions. After that job was finished, the barrel was reinstalled on the gun, and the ·41 cylinder was removed and carefully rechambered and rethroated to ·45 Colt.

The result is what appears to be a standard M58 revolver but in ·45 Colt caliber, something not currently available from the factory, and in my opinion, probably the finest ·45 DA gun one could have these days. Actually, any one of several S&W N-frame guns could have been converted in the same fashion; the M27, M28, M57, or M29. If one were after a ·44 Special instead of ·45 Colt, then any of the ·357 or ·41 Magnums could have been converted in the same fashion. For the reboring and cylinder rechambering work just mentioned, see the chapter on reboring and relining.

A shooter may often decide that he must have the maximum effectiveness in a revolver shot load. While there are numerous hand- loaded and factory loaded shot shells suitable for revolvers currently available, achieving the absolute maximum performance requires alteration of the gun. Essentially, this consists of boring out the chambers completely straight, then making up cylinder-length straight cases which will contain maximum loads of powder and shot. This is mentioned here only because it constitutes essentially a caliber conversion; the process is covered in detail elsewhere under the heading of handguns for shot.



Revolvers, too, can be converted from one caliber to another by either installing readily-available new barrels and cylinders, or, by reboring or relining the existing barrel and cylinder. In this case, a ·41 Magnum had its barrel relined and its chamber rebored to ·45 Colt.

Often, either as an end in itself, or simply as part of rebuilding a revolver, it may be desirable to change its caliber to some other for which the model was or may still be manufactured. A much simpler method for this than any of those already discussed is merely the replacement of barrel and cylinder (with related extractor) of the proper caliber. If the gun is currently in production in the caliber desired, acquisition of a replacement barrel and cylinder from the manufacturer through usual sources presents no problem. On the other hand if the caliber or model has been discontinued, any one of the several obsolete parts houses listed in the appendix may be able to supply the necessary parts. In any event, it is generally possible to rebarrel and recylinder a gun in any caliber for which it was ever manufactured without any difficulty. The actual processes for properly fitting the new barrel and cylinder are covered elsewhere in this volume.

CONVERSIONS NOT TO ATTEMPT

When this type of new-parts conversion is contemplated, one must keep in mind that parts which will fit a particular basic model may not necessarily be in a caliber that is safe for use on the original frame. The classic example of this would be attempting to install a ·44 Magnum barrel and cylinder on an M1917 S&W frame. The two parts can be fitted and the gun will function with them in place, but the material, heat treatment, and dimensions of the 1917 frame are simply not adequate for the loads placed upon it by the potent ·44 Magnum cartridge. The same situation would obtain if one attempted to fit ·41 or ·357 Magnum parts to the same frame, and also if one attempted to fit M19 ·357 Magnum parts to the M10 Military and Police model.

It is for these reasons that most manufacturers refuse to sell Magnum caliber replacement barrels and cylinders except via factory installation on your gun. Many home-brewed pistolsmiths have objected strenuously to this policy, but in reality it is simply a form of liability insurance. The manufacturers can certainly be excused for taking a position in parts sales which will at least help prevent misguided efforts at conversion which could or would prove dangerous to either the shooter or bystanders.

THE WESSON DESIGN

Whereas quick-change of calibers is possible in many autoloading pistols, generally speaking, revolvers do not permit this owing to the way in which they are assembled. There is, however, one exception to this rule, the interchangeable-barreled Wesson revolver. This design is also currently offered under the High Standard name as the Sentinel Mark II or Mark III.

The Wesson design is most unusual in that it utilizes a thin, tubular barrel threaded loosely into the frame. This barrel is turned in easily by hand, then is covered by a close-fitting shroud which is clamped in place by a nut turned on the threaded muzzle of the barrel proper. Once the barrel is adjusted to the correct cylinder/barrel gap by means of a feeler gauge (provided with the gun), turning the muzzle nut down tightly creates a very solid, rigid assembly, and holds the barrel in tension and the shroud in compression against the frame.

Obviously, this method of assembly, though intended simply for interchanging various barrel lengths, is ideally suited for changing calibers. To make an interchangeable-caliber weapon one would need simply to convert a replacement cylinder to some other caliber by one of the methods already described, then turn and thread a new barrel in that same caliber. After that, it would simply be a question of replacing the original-caliber barrel and cylinder with the new one, and this can easily be done in only a couple of minutes.

As of this writing, there has been no commercial production of any caliber-con version kits or accessories for either the Wesson or High-Standard guns. We do know, though, that Dan Wesson has seriously considered making such convertible guns and accessories available, and that he may do so at some time in the future. In the meantime, If you want a convertible-caliber revolver, the basic Wesson design under either of its two names provides an excellent vehicle for such an alteration.

It is pertinent to mention also that in the past there have been several companies which specialize in the fabrication of revolver barrels and cylinders in nonoriginal calibers. Of the shops which once made such parts, I believe only the Christy Gun Works still does so widely. In its catalog, it lists a variety of special barrels and cylinders in numerous calibers for the SAA Colt. Quite possibly and at some increase in cost, this company could also supply off-caliber parts for other models.

CHAPTER 27 - Military Handguns

At the outset, it was intended to deal at length and in detail with military handguns separately. It seemed at the time that they differed enough to require such treatment—but now I'm not so sure of that. However, we will try to cover here those things about military side- arms not included in the other chapters.

To begin with, virtually all standard military sidearms today are autoloaders. By WW II, all but a very few nations had changed over to autos. During that war, the U. S. supplied millions of revolvers to allied nations, purely as a stop-gap measure until sufficient autos could be obtained. The majority of these revolvers were disposed of following the war, and the few hold-out nations finally went over to the auto. At this time, no nation has a revolver as its standard military sidearm.

This isn't to say that revolvers don't still see military use. They do, but as special-purpose arms among aircrews, intelligence and criminal investigation units, elite guards, and the like. They are also widely used by para-military national police organizations in many countries.

MILITARY REVOLVERS—SOME PROS AND CONS

The few genuinely military revolvers that will be encountered are long obsolete, their designs dating from the late 1800s. None of them have been manufactured for over 50 years, aside from the Soviet Nagant (replaced in 1933) and the British Webley/Enfield made through WW II. The others, the Mausers, Peipers, Nagants, Abadies, Gassers, Lebels and the like are an extinct breed for which parts are virtually unobtainable, and for which ammunition is quite scarce. Further, all of those old designs contain materials and technology nearly a century old, and were made in the beginning strictly for low performance, black powder ammunition.

In short, those guns simply aren't worth repairing. Collectors will want to restore them by replacing missing parts and the like, but they are not candidates for repair to shooting condition. With one exception.

This concerns the Webley ·455 and ·38/200 and the Enfield ·38/200 revolvers dumped here as military surplus by Great Britain after WW II. Used with the proper ammunition, they are perfectly safe and reliable guns, and are made of excellent materials. Fortunately, they are simple mechanisms in which parts are easily replaced with little fitting; more fortunately, parts houses in this country have large stocks of new and excellent ex-British parts to fit all models and variations. Consequently, repairing Webley and Enfield military six- guns is not only practical, but easy and economical.

All the other so-called military revolvers of U. S. extraction, Colts, Smith & Wessons, you'll encounter are really only standard commercial models procured for special military use or to fill in when a shortage of other arms existed.

During WW I, large quantities of the big S&W ·44 Hand Ejector were simply fitted with ·45 ACP barrels and cylinders and purchased by the U. S. Government as the M1917 ·45; Colt also sold large quantities of its New Service model similarly altered. Further, the British Government bought large quantities of both models in ·455 caliber.

Aside from caliber, those models are simply contemporary (1917) commercial revolvers. As far as the S&W is concerned, the same basic N-frame gun is still in production in other calibers, and parts are available. In addition, the parts houses can still supply most original military-contract parts except barrels and cylinders. Even new ·455 cylinders are usually still available.

The Colt New Service hasn't been made since WW II, and so no parts are available from Colt, but substantial quantities of both military and commercial parts are still available from the parts houses. Further, at least one parts house has manufactured new barrels and cylinders. Though these two big revolvers are well worth repairing in their original calibers, these days they are more esteemed for conversion to ·45 Colt, ·44 Special, and ·44-40 calibers.

S&W M1917 has in the past been widely available as surplus and makes an excellent sixgun; most parts readily available.

This big ·455 Webley is plentiful and parts are widely available. A sound and reliable, if not attractive gun.

Far more common are the ·38/200 and ·38 Spl. Colt and S&W revolvers of WW II vintage; the Colt "Commando" and S&W "Victory Model". Many hundreds of thousands were made for the British and U. S. Governments from 1942-1945, the ·38/200s being British and the ·38 Spls. being U. S., though during and after the war, they wound up in many other countries. The Victory was simply the S&W M&P model of the period, and the Commando was the contemporary Official Police model. Parts for those models are plentiful and make repair easy. Military surplus parts are also plentiful.

Many of the ·38/200 guns will be found rechambered to ·38 Special, leaving the chamber oversize at the rear and causing bulged cases. Safe enough with light loads, but they should be re-cylindered if modern, hot loads are contemplated. In contrast to the WW I M1917 guns, these WW II military-contract revolvers are usually roughly finished and poorly fitted as compared to contemporary commercial production.

One may encounter virtually any U. S. -made revolver bearing the "U. S. Property" stamp, indicating government purchase. This indicates that all manner of commercial revolvers have been purchased "off-the-shelf' to meet certain requirements during both war and peace. The guns are invariably standard commercial models and should be treated as such, except from the collector's point of view, an area in which such guns often bring premium prices, if their originality is not destroyed.

MILITARY AUTOLOADERS—SOME PROS AND CONS

There is much more variety in military autoloaders. Virtually every nation with the capability of producing a native auto design has done so, and has made it a matter of national pride to adopt its own gun, regardless of its defects. During the period 1900-1940, a wide variety of autoloaders were adopted and produced in relatively small quantities by lesser nations, while Germany had the Parabellum (Luger) and broomhandle Mauser, the U. S. the Colt M1911, Russia the Tokarev M1933, and the like.

Thus you'll encounter many military autoloaders which are of inferior and obsolete design and for which parts are nonexistent. Among them are the various Mannlicher designs of 1900-1910; the Italian Glisenti; the Austrian M12 Steyr-Hahn; the Polish Vz35 Radom; the Spanish Astra M1921 M400; the Danish Bergman M1910 and M1910/22; the older M1920/21/22 Spanish Stars; Chinese copies of the Mauser M96; and a number of others.

Generally speaking, this group of guns isn't really worth costly repairs except, perhaps, to restore them as collectors' items. Minor replacement of pins and springs is justifiable, as is simple replacement of parts, if parts can be found. Parts are a problem, and virtually the only sources are the houses which cannibalize old guns. They can sometimes supply a few used parts from stock, and some will put your name on a waiting list for a particular item against the time when they might be able to pick up a gun for cannibalization.

The more common military handguns are another matter: Browning P35; Parabellum (Luger); Colt M1911 series; Walther P. 38 and PP series; post-1930's Spanish Star and Llama; French M1935 series; Browning M1910 and M1922; even the Lahti for which parts are plentiful though it wasn't widely made; Mauser HSc; Colt ·32 and ·380 Pocket Models; Beretta M51; Turkish Kirikkale; and a few others.

Parts are plentiful, or at least not difficult to find, all are chambered for readily-available ammunition, and they are of good, sound design, even if sometimes a bit obsolete. These guns are also of relatively simple and well developed designs easily understood, rather than the earlier complex systems, which sometimes even defy logical disassembly.

Polish Radom VIS (model) 35 is 1930s development of the Colt/Browning, a good, reliable design; some parts available.

Browning/FN HP (P 35) is widely distributed as military side arm and often encountered in several variations; new and old parts usually available.

THE PARTS SITUATION

Since parts drawings and exploded views of military handguns aren't normally available from the manufacturers (as they are for commercial guns), it is especially essential that you obtain the books containing them. Most models have been published at one time or another by various sources. A principal source of soft-cover books containing these drawings and also disassembly instructions is Firearms Assembly II: NRA Guidebook to Handguns. Digest Books, Publisher's Development Corp., Brownell's, Shelley Braverman, and the Stackpole Company all publish volumes that contain such material on military handguns. All are invaluable references.

Parts sources are discussed in detail elsewhere in this book, but a few comments are in order here. The surplus military parts advertised widely are often not new—they may be new, original military-contract parts that meet proper specifications, or they may be new parts rejected by a government agency because they did not meet specs. They may be used parts generated by rebuild or overhaul programs, and thus contain both serviceable and unserviceable items. They may be parts cannibalized from junk guns by the seller. They may be new parts that laid untended in poor storage conditions for twenty years or more and so be stained or rusted. They may be brand-new parts just manufactured by a specialty house for a gun not made since 1900. In fact, they may be anything from pristine new parts made yesterday to pure junk.

The point is that you shouldn't expect too much from military surplus parts. Only when you have the part in hand and can install it and verify that it fits and functions correctly can you be certain it will do.

There are too many military auto types and models to discuss in detail. The most common repairs will be refinishing and replacement of pitted or shot-out barrels (due to corrosive-primed, wartime ammunition) and battered, broken, or missing grips and magazines. These procedures are covered under their own headings elsewhere in this volume.

CHAPTER 28 - Special Accessories and Attachments

While a number of attachments and accessories have been mentioned in passing—as they pertained to particular jobs—elsewhere in this book, such a wide variety is available that they should receive separate and more detailed attention. The best approach seems to be listing the various types of accessories, with a detailed description and information on their functioning and installation.

AUXILIARY CHAMBER: A cartridge-like device turned from brass or steel to fit in revolver or auto chambers. It is further chambered to take a smaller caliber cartridge. When a cartridge is loaded into the auxiliary chamber and the latter then placed in the gun chamber, the cartridge will be fired in the normal fashion. When the cartridge used is the ·22 rimfire, the chamber is offset so the gun's center-fire firing pin can strike the rim of the case. This device is simply slipped into the gun's chamber (s) and no alterations for its use are required.

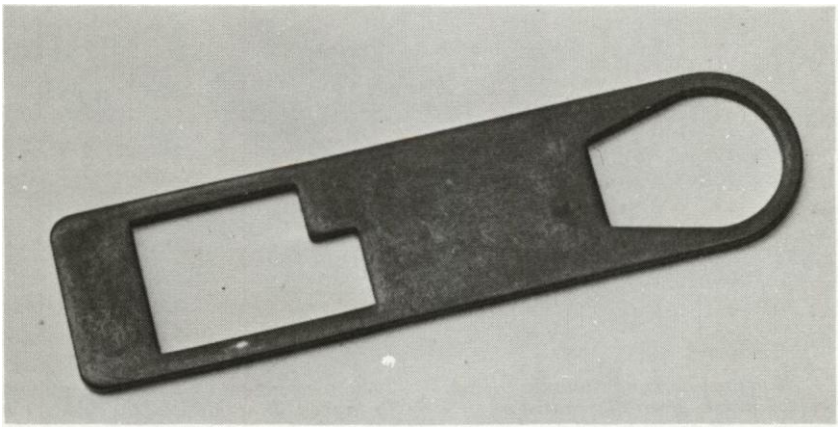
BELT HOOK: A simple wire or sheet metal hook attached to one side of the gun, to be slipped over one's belt for carrying the gun without a holster. Easily fabricated, but commercially available only as a sheet- metal part for the Colt G. M. Installation merely requires removal of the grip, laying the hook over the screw bushings, then re-installing the grip. No pistolsmithing is required.

BUSHING WRENCH: A special wrench supplied by various makers to remove and replace tight-fitting match bushings.

COLLET BUSHING: A replacement barrel bushing for the Colt G. M. in which spring fingers provide a more secure grip on the barrel than the original bushing. Simply replaces the original bushing, no gunsmithing required.

COMBAT SAFETY: For autos, a Browning-style manual safety on which the thumb piece has been extended outward and forward for easier and faster manipulation. Available from several sources. Some models can be installed without any fitting, others require stoning of oversize engaging surfaces to fit, and perhaps relieving the grip adjacent to the safety.

COMPENSATOR-MUZZLE BRAKE: A conventional slotted or ported muzzle attachment to reduce recoil and jump. Those supplied by the gun makers either clamp or screw to muzzles without alteration. Some others require filing or machining clearance at the muzzle. Those made for the Colt G. M. replace the existing barrel bushing. One type, the Mag-Na-Port, is machined directly in the barrel by EDM (electronic discharge machining) and can only be applied by the manufacturer.



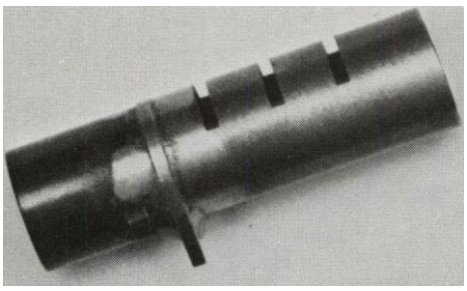
Right end of this wrench is for turning GM barrel bushings tight.

CONVERSION UNITS: Usually made only in ·22 LR caliber and consisting of a slide, barrel, magazine and related parts necessary to convert a center-fire auto to ·22 LR. Commercial units are offered for the Colt Government Model, the SIG M210, and the Walther P. 38. The SIG/Sauer M220 scheduled for introduction in 1975 will also be supplied with both center-fire and ·22 rimfire conversion units.
Conversion units are made for installation without tools and without alteration to the basic gun, so no pistolsmithing is involved.

COUNTERWEIGHTS: Generally available only for autos, and usually supplied by the factory to fit a specific model. They are intended to increase a gun's weight and at the same time shift its balance forward to improve holding for serious target work. They are beneficial for this purpose.

Factory-supplied models normally clamp into existing grooves in frame or barrel—others may require drilling and tapping holes or cutting grooves or flats in the frame. Generally, they are easily installed.

CUSTOM GRIPS: Grips in all manner of styles, types, and materials are widely available to fit virtually all popular autos and revolvers. Generally, no gun alterations are required—simply remove the original grips and screw the new ones in place.



Compensators and muzzle brakes of this type are offered for the Government Model pistol, generally consisting of a body brazed or welded to the face of a replacement barrel bushing. They are not generally too successful because of the large muzzle clearance required for the exiting bullet.

DOUBLE-ACTION CONVERSION: Not strictly an accessory, this is a major machining and parts replacement job done by Louis Seecamp and his licensees on the Colt G. M. series, and probably by the time you read this on the Browning High Power. This conversion requires extensive fixturing and machining so must be done at the factory. The one alternative to this is that Seecamp offers a limited number of frames with the work completed, upon which you may install the rest of the parts from your own sources.

GRIP ADAPTERS: For revolvers. Devices intended to be clamped to the revolver frame between trigger guard and grip frame to provide a solid seating surface for the index finger. Two types are available, the smoothly curved Pachmayr or Mershon made from a resilient rubberlike compound, and the cast-aluminum Tyler with individual finger grooves. Both are attached without gun alteration by a simple spring- steel clip seating under the grips.
These adapters do work well, improving revolver handling qualities, and substitute for costly custom grips which accomplish the same purpose. Since 1935 S&W has offered grip adapters as an accessory.

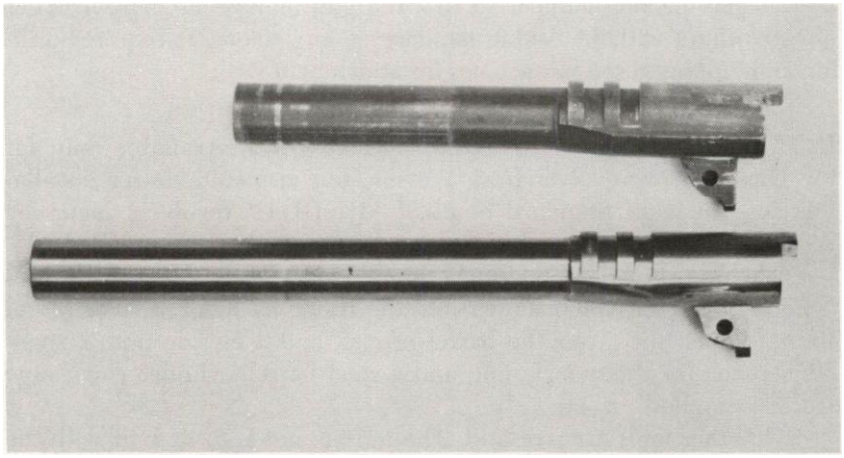
HAMMER SHROUD: Offered by Colt for some revolvers; a metal hood enclosing the hammer so that the gun may be fired from under one's clothing without risking hammer entanglement. It requires drilling and tapping three screw holes for attachment.

INTERCHANGEABLE REVOLVER BARRELS: Available only for the Dan Wesson revolver from Wesson, but also suitable for installation on the High Standard Sentinel MK III/IV revolvers made by Wesson.
The unit, in 2¾-inch, 4-inch, 6-inch length, consists of a thin-wall cylindrical barrel which screws into the frame by hand, a large barrel shroud which slips over the barrel proper, and a muzzle nut. A spanner wrench for the muzzle nut, and a steel barrel/cylinder gap gauge are also supplied.
No other tools are required. The muzzle nut is turned off with the spanner, the shroud is pulled off, and the barrel is unscrewed by hand. Then, the new barrel is screwed into the frame until it contacts the gauge laid across the cylinder face. The shroud is then slipped over the barrel, and the muzzle nut turned up tight. Drawing out the gap gauge readies the gun for firing.

LEFT HAND SAFETY: An auxiliary manual safety offered for Browning-type autos wherein a new safety lever is fitted on the right side of the gun, attached to the inner mechanism of the original safety. Normally no 'smithing is required other than relieving the right grip to provide clearance for the thumb piece.

LONG BARRELS: Several specialty shops supply extra-length barrels for the several variations of the Colt Government Model auto. Usually offered in ·45, ·38 Super, 9mm P., ·38 Spcl., or some wildcat cartridge such as the ·38/45, they are installed just as any replacement barrel without any alteration to the gun. One type (Dwyer) offered carries its own front sight threaded to the muzzle—and this usually requires that the gun's original front sight be removed, unless a higher rear sight is installed.

LONG LINK: Replacement barrel link made for the Colt G. M. with greater hole spacing than the standard link in order to seat the barrel more tightly into the slide. Simply replaces the original link, but sometimes requires careful filing and fitting of locking ribs to their recesses in the slide.



Even special long barrels are available from at least a couple of sources for the Colt Government Model. Shown here is a 6½-inch unit available from Whitney Sales in ·38 Super caliber which allows higher-than-standard velocities to be obtained.

MAGAZINES: For auto pistols, of course. Several firms supply replacement magazines of standard configuration, but a few supply special designs. Extra-capacity magazines are the most common, mainly from Triple-K, and are simply standard magazines made in greater lengths. For example, magazines for the seven-shot Colt Government Model ·45 are available in lengths holding 10, 12, 15, 20, 25, 30, and even 40 cartridges. Frankly any magazine extending more than an inch or so beyond the butt of the gun becomes a liability. Handling suffers so much that longer magazines must be relegated to the "gimmick" class or restricted to plinking where handling problems can be disregarded.
Special followers are made for improving feeding from standard magazines, and stainless steel internal magazine parts are offered for the corrosion-conscious pistolero. So-called combat magazines with added anti-friction coatings and soft bottom pieces or extended finger rests are also available.
All these special magazines are designed for use in standard guns, so no pistolsmithing is required.

MATCH BARRELS: Specially designed barrels, usually only for the Colt G. M. in ·45 caliber, made with extra stock for hand-fitting to the gun and supplied with a matching barrel bushing. Available from several firms, they require careful, skillful hand fitting to slide and frame.

MATCH BARREL BUSHING: Replacement barrel bushings for the Colt G. M. pistol, made oversize externally and undersize internally to allow hand-fitting as snugly as possible to slide and barrel. Must be carefully lapped, polished, and fitted as described under accurizing.

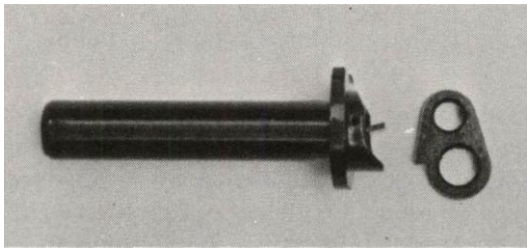
NIGHT SIGHTS: Several types are available and most require at least some gun alteration. Generally they employ either radioactive luminous coatings on oversize sight elements or low-level sight illumination by means of miniature bulbs and electrical circuits and batteries. Installation ranges from simple bolt-on operations to extensive machining requiring a high degree of skill. Most makers of such sights require the installation to be done in their own shops.

REBOUNDING FIRING PIN: A replacement firing pin unit for the SAA Colt which fits into the frame. Installation requires drilling and reaming a hole in the recoil shield, removal of the original firing pin, and reshaping the Colt hammer.

RECOIL BUFFER: Made for Colt Government Model variations. The buffer consists of adding a heavily spring-loaded plunger to the recoil spring guide. All but one type (Dwyer Group Gripper) is installed as a unit without any work on the gun. The Dwyer unit requires also a special barrel link, supplied with it, which must be substituted for the original link.

RIB/SIGHT UNITS: Several companies offer large aluminum or steel sighting ribs completely machined to fit right on standard autos and revolvers. They contain conventional target-type adjustable sights. Installation requires only the removal of the existing rear sight and sometimes the front sight, and the drilling and tapping of several screw holes in the slide or barrel.
These units are quite effective and easy to install but do add up to five or six ounces additional weight to the gun.

SHOOTING RESTS/SHOULDER STOCKS: Several shooting aids are available which perform the steadying function of a shoulder stock without being affixed to the gun proper. Lacking a mechanical connection to the gun they do not fall under the control of GCA '68, so may be used freely.
Several types exist. Each consists of a shoulder piece and an arm extending forward toward the gun. One type terminates this arm in a ball and socket joint attached to a heavy wrist band on the shooting side. In this fashion it steadies the gun arm without actually contacting the gun. A second type carries at its forward end a pocket shaped to fit the gun butt, and the shooting hand grasps both butt and pocket, holding them together and thus steadying both arm and gun. A third type consists merely of a heavy wire bracket attached to the gun butt and extending back along the wrist and under the forearm, reaching to the midpoint of the forearm. It serves only to support the wrist and gun against the forearm.
All three types fit without alteration to the gun, so require no pistolsmithing whatever.



This unique “group gripper" by Dan Dwyer places a heavy leaf spring inside the recoil spring guide which acts upon a shoulder on the barrel link to eliminate looseness at the breech and thus improve accuracy.

SPEED-COCKING UNIT: For Colt G. M. autos, a bolt-on accessory of two types. One utilizes a much-extended manual safety with an accompanying internal system of cams and levers to cock the hammer by downward safety movement. Some stoning, hand-fitting, and replacement of parts is needed for installation, and the left grip must be altered.

This Allan Speed-Cock kit replaces the GM manual safety and allows thumb- cocking by downward pressure on the lever.

Double-Ace squeeze-cocking unit for Colt GM is supplied by Caraville Arms, allows gun to be cocked or fired by squeezing long lever that replaces mainspring housing and grip safety.

The other type unit, the Caraville Double Ace, replaces the grip safety and mainspring housing with a lever pivoted around the safety shaft. Squeezing the bottom of the lever inward actuates cams and levers which cock the hammer. No alteration to the gun is required other than replacing the existing hammer strut with the one supplied.

SPEED-LOADERS: A loading device for revolvers which grips the requisite number of cartridges in proper alignment for simultaneous insertion in all chambers, yet allows quick release of cartridges once they are in the chambers.
Depending on loader type and type of grips on the gun, a large relief groove may have to be cut in the left grip before the loader can be employed. This is easily done with files, hand grinder, or chisels.

TRIGGER GUARD SPUR: A simple, triangular metal casting attached to the lower front of the trigger guard bow of autos to provide a secure seat for the off-hand forefinger in two-hand shooting. Installation is by epoxy, solder, or screws. If the latter, holes must be drilled and tapped in both spur and guard. Some filing may be necessary to flush the spur with the guard, and spot bluing then becomes necessary.

TRIGGER SHOE: Made for both revolvers and autos, a simple curved piece of metal shaped to fit over the existing trigger and to provide a wider trigger face and/or move that face forward to increase trigger reach. Also sometimes provided with an integral adjustable trigger stop. Installation requires only placing the shoe over the trigger finger piece, then tightening clamp screws. Some shooters also ask that the shoe be pinned, soldered, or epoxied in place, since the tiny clamp screws are prone to work loose.
Doubtless there are other accessories and/or attachments that will appear in the future, for handgun buffs are most imaginative. Because of the many possibilities in this field, the author would be pleased to hear of any not listed.

CHAPTER 29 - Handguns for Shotshells

From time to time in the past, virtually since the beginning of the center-fire metallic cartridge, various manufacturers have offered shot loads in several different handgun calibers. In years gone by one could obtain shot-loaded cartridges in calibers as small as ·32 and on up through the big ·44 and ·45 numbers. But most of those loads have long since been discontinued.

Generally such loadings held a relatively small charge of powder and contained their shot within a hollow wooden or paper bullet extending beyond the case mouth. Such loads provided some degree of shotshell performance, but when compared to some of today's factory- loaded offerings, and particularly to special custom-loaded handgun shotshells, they did very poorly.

ABOUT MODERN LOADS

Today, the handgunner wishing to use shotshells for killing small predators or dangerous species (venomous snakes, etc.) may purchase reasonably good shotshells in several calibers, or if he demands the ultimate in performance or some caliber not already available, he can handload shotshells which far exceed the performance of those offered in years gone by.

No matter which option he selects, shotshell performance can be improved by gun modification, and if maximum performance is desired, modification is essential.

Today's crop of factory-loaded shotshells and factory-offered components for handloading shotshells usually encapsulate the shot charge in a plastic cup. This cup is generally formed by molding, with one end open, after which the shot is placed in it, and the open end heat-sealed or closed by a tight fitting disc or plug.

The shot is encapsulated thus for several reasons: first, the plastic protects the shot from the rifled bore and thus drastically reduces the amount of deformation that would otherwise occur, and so reduces flyer shot; two, use of encapsulated shot as a unit greatly simplifies machine-loading in factories, as well as handloading; three, by extending well beyond the case mouth, the plastic capsule allows a substantially greater charge of shot to be used than could be contained in the case alone.

In normal functioning, the plastic capsule is intended to break apart as it leaves the gun muzzle and allow the shot charge to continue onward as a unit, relatively undisturbed. Some makes of capsules are fairly successful in this respect, others don't do as well. The design which seems to perform best in this respect is the Speer (available separately or factory-loaded into ·38 Special and ·357 Magnum cases) whose capsule nose is brittle and lightly scored so that it begins breaking up in the bore—when it leaves the barrel, the lightweight capsule drops behind the shot charge which travels on relatively unimpeded.

Other makes, due to different design, different plastic, and thicker construction, will occasionally remain intact and strike the target as a single shot-filled projectile. Some makes I've tried will do this as frequently as 20% of the time.

Generally, though, loads of this type are entirely adequate for killing snakes or small rodents up to a distance of 10 to 20 feet, depending upon the amount and size of shot which is, of course, dependent to a large degree upon bore diameter. But this when fired from unaltered guns or guns without any auxiliary choke or stripping device.

Another type of shot load exists in ·44 Magnum caliber only, and it is loaded to greater than standard overall length to allow a heavier charge of shot to be used. Consequently, it cannot be used in revolvers, and is intended by its maker (Thompson/Center) only for use in the T/C Contender "Hotshot," single-shot pistol. While this load may be fired in a standard ·44 Magnum barrel with reasonably good results, it is designed for use in the Hotshot barrel with a special straight-rifled or grooved choke tube. The straight ribs or lands in the choke tube serve to break up the plastic capsule and allow the shot charge to proceed unimpeded, while at the same time the constriction in the choke tube provides choking action as is found in the typical smoothbore shotgun barrel. It greatly improves pattern density and uniformity. Generally speaking, when the ·44 Hotshot cartridge is fired in its companion Contender barrel it will produce patterns out to 20 yards or so which may be compared quite favorably to patterns produced by moderately choked ·410 gauge shotguns. In addition, the Hotshot contains a shot charge fully as great as that found in the average ·410 field load.

IMPROVING THE SIX-SHOOTER'S PERFORMANCE

Let's take a look first to what can be done to the average sixgun to improve its performance with encapsulated shot charges. First of all, there really isn't any point in modifying a ·38 or ·357 Magnum because even the heaviest shot loads or shot capsules available contain too little shot to work with. The bigger bores are another matter, and ·41, ·44, and ·45 shot capsules are available, principally from REMCO.

If the caliber in question is ·44 or ·45, then substantial pattern improvement can be obtained by fitting the T/C Hotshot choke tube to the gun's muzzle. This requires turning the barrel muzzle round for about 1/4 to 3/8″ and threading it to accept the Hotshot tube. This muzzle reduction will cut away at least part of the front sight on all revolvers. Sufficient front sight may be left for normal use, but if not, then a new front element must be made and fitted as described elsewhere in this volume.

Once the choke tube with its internal ribs is screwed to the muzzle, it will function just as it does on the Hotshot pistol—its longitudinal ribs will break up the REMCO or similar shot capsule as it passes through, to insure freedom of the shot charge, and will also provide choking action.

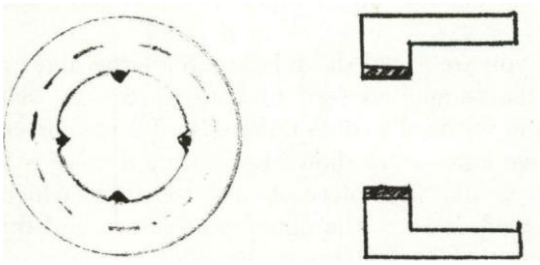
Though the Hotshot tube is made specifically in ·44 caliber, it will also function very nearly as well when fitted to ·45 caliber guns. Since the encapsulated shot charge does not represent a solid projectile, even in ·45 caliber, it will squeeze through the slightly smaller ·44 choke tube without damage to the tube or gun, though with some additional deformation of the shot pellets due to the crowding that must take place as they pass through the constricted portion. You could, of course, machine a ·45 caliber choke tube identical in design to the Hotshot accessory, but it seems unlikely that the cost and effort could be justified.

Once the Hotshot tube is fitted, it may be removed as desired, and the gun fired with standard ball ammunition. If the gun is to be carried with the tube removed, then a protective collar should be made and screwed over the threaded muzzle to prevent damage to the threads.

When the gun is in ·44 caliber (not ·45) then ball ammunition may be fired through it in emergencies with some reservation. Those reservations are that the bullet be of lead only (not jacketed) and that the load be moderate. High performance ·44 Magnum loads with jacketed bullets should not be fired through it.

An alternative solution which insures breakup of the shot capsule but does not provide any choking action consists of making a stripper ring and threading it to the muzzle as above. The drawing shows this as simply a threaded ring to screw over the muzzle but which contains four knife-like inward projections which intrude over the muzzle face sufficiently to slice through the shot capsule as it leaves the barrel. This insures breakup of the capsule and that it is left behind by the shot charge. Thus it improves the pattern consistency and eliminates one- hole capsule hits.

This ring is easily made by turning the shell on the lathe as shown in the sketch, then filing the undersize muzzle hole back to bore groove diameter while leaving the triangular projections to slice through the capsule. If only for occasional use, this part need not be hardened—but if you'll be using it a great deal, it should be hardened so that the strippers won't wear too quickly. Incidentally, this type of muzzle attachment is not at all new—it was used in the last century to insure the breakup of segmented bullets fired by large-caliber automatic weapons.



This stripper ring, threaded to the muzzle of a handgun, insures breakup of plastic shot capsules by the four V-section "knives" left projecting into the path of the capsules.

A smooth choke tube screwed to the muzzle of the barrel will produce some improvement in encapsulated shot loads, the amount of improvement dependent to a large extent upon the construction of the shot capsule. If a thin-wall capsule, improvement will be more marked than if it is a thick, heavy plastic cup. However, a smooth choke tube is of much greater value when handloaded shotshells are used without plastic capsules. And, in the end, maximum performance can be obtained from handgun shotshells when a smooth choke tube is used in conjunction with cylinder-length cartridge cases, maximum shot charges, and an altered cylinder. In fact, a ·45 revolver can then be made to deliver performance very nearly equal to that of the standard ·410 shotgun field load.

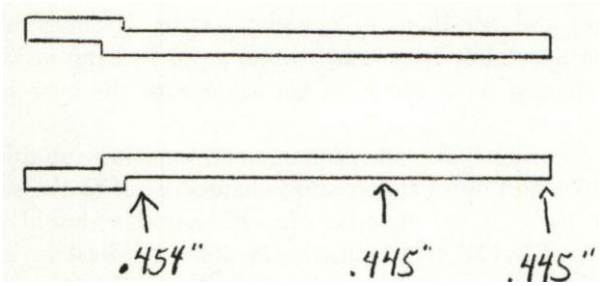
The choke tube is essential to the system, so let's look at it first. The sketch shows the details and dimensions for ·45 caliber. One need only reduce the inside diameters of the choke area proper by ·025″ to adapt it to ·44 caliber. A lathe is required, and the tube may be made of cold-rolled steel or almost any scrap steel that happens to be laying around. Ideally, steel tubing will require the least work.

The attaching thread diameter as shown is proper for most modern ·45 caliber revolvers, but on some older models in ·44 caliber it may require reduction in order to allow a full depth thread to be cut on the gun's muzzle. Some of the older ·44 barrels are quite thin at the muzzle, and don't offer much stock for reduction and threading.

Begin by chucking your stock in the lathe and counterboring and threading the part that fits over the muzzle. Then, drill and bore or ream to the inside diameter shown. This will be the finished choke diameter at the muzzle and a few thousandths of an inch should be left for polishing. Reverse the stock in the lathe and, if desired, reduce and contour the outside dimensions to reduce weight, and cut the tube to length.

Now, if you are a real sharp lad with a lathe and boring bar, you can set up the compound feed to bore the tapers that provide the choking action inside the tube. Otherwise, I'd recommend making up the simple two-flute cutter shown by slotting a piece of bar stock and soldering or pinning in a piece of 1/16″ tool steel which can then be ground and filed down to the dimensions shown and then sharpened.

With this tool, simply insert the pilot in the rear of the blank choke tube and turn the cutter by hand or power (with plenty of lube or coolant) until the inner contour of the choke tube is completed. Pull the cutter out frequently and clear away chips to obtain a smooth surface. Once this is done, polish the inside of the choke tube with fine abrasive cloth or paper inserted in a slot cut in a piece of 1/4″ rod rotated by your electric drill. Keep the abrasive moving lengthwise of the tube in order to avoid jugging it at any particular point.



This choke tube, shown in section, can be adapted to almost any big-bore revolver. The enlarged end must be threaded to fit corresponding threads cut on the muzzle of the gun, and thread size should be the largest that can be cut full depth on the gun barrel. Internal choke dimensions are given for ·45 caliber, but can be reduced correspondingly for ·44 or ·41 guns. The choke proper, exclusive of the threaded portion, needs to be only about 2½ inches long, tapered inside for the first two-thirds of its length, then cylindrical at reduced choke diameter for the remaining distance to the muzzle.

When all that is done, cut back the front sight and thread the muzzle to match the tube, file a couple of wrench flats on the rear of the tube, and screw it in place. Make certain the rear of the choke does not overhang or interfere with the muzzle of the barrel. If it does for some reason or another, ream or polish the rear to a slightly greater diameter so that as the shot charge moves from muzzle to choke tube it doesn't encounter any interference.

Even made from cold-rolled steel and unhardened, this tube will give good performance for quite a number of shots. Nevertheless, I would recommend hardening it, especially if you anticipate a good deal of shooting, or if you've made the walls quite thin in the interest of weight reduction. Blue or other finish is naturally desirable for appearance's sake, but that is easily accomplished as outlined elsewhere.

As already mentioned, the above choke tube will work some improvement on almost any factory or home-brewed shot load you might encounter. But if you want the very best in performance from a shot revolver, then it will be necessary to further modify the cylinder of the gun and to concoct special cases and loads.

If your gun is ·45 caliber (·45 Colt), obtain some ·444 Marlin empty cases and cut them to cylinder length. If the gun is of ·44 caliber (·44 Special or Magnum) obtain a ·30-40 Krag or ·303 British cases and shorten them similarly. Set aside until the cylinder work is done.

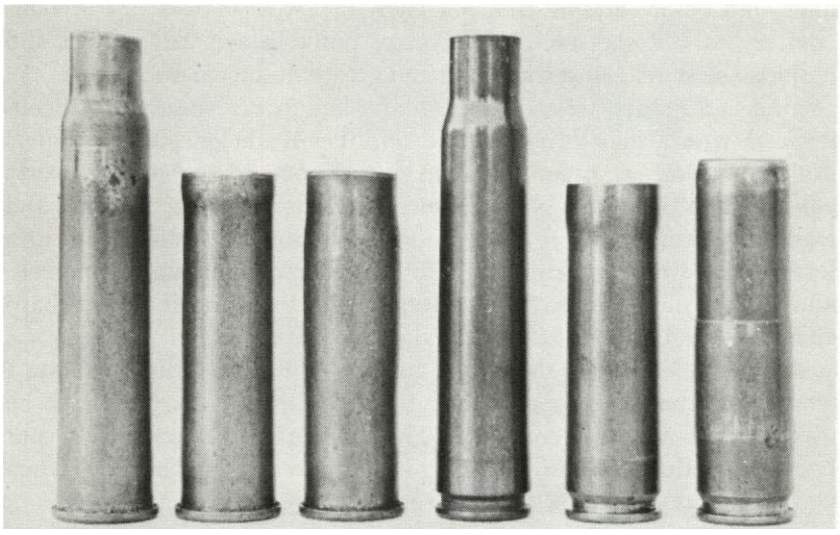
With a boring tool, expansion reamer, or other suitable method, cut the throat portion of the existing chambers out to the same diameter as the body of the chamber. In ·45 Colt this should produce a diameter of ·475- ·480″, ·44 caliber ·455- ·460″. It's best to leave these areas slightly undersize and finish by a smooth polishing job.

Now, prime your ·444 cases, and drop in a charge of 7·0 grains of Unique powder. Follow with a card over-powder wad (fitting tightly) and 1/8 to 1/4″ of felt, cork, or composition filler wads. Pour in #9 shot to within 1/16″ of the case mouth. Seat a card, plastic, or thin zinc overshot wad in the case mouth, carefully leveling it so that an equal amount of case protrudes beyond it all around. Crimp the case mouth over the over-shot wad by running it into a ·45 Colt crimp die, keeping the overshot wad solidly and level against the shot by means of a dowel inserted through the top of the die. Turn the heaviest crimp the die will produce, and your Magnum shotshell will be complete.

So loaded, the shortened ·444 cases are now ready for firing and will produce their full potential. However, because of its sharper taper, the cut-off ·30-40 case must be fire-formed to fit the new straight chamber before it will hold its full and proper load. To accomplish this, first bell the mouth of the case so that it will accept a ·44 caliber over-shot wad deeply enough to allow a moderate crimp. Then charge with 7·0 grains of Unique, a quarter-page of toilet tissue wadded up and rammed solidly on the powder, and pour in shot to the level already mentioned. Add the over-shot wad and crimp in a ·44 Special or ·44 Magnum die as before. This wasp-waisted load must then be fired in your altered gun and the pressure of firing will expand the case cylindrically to fit the chamber. This must be done to each case before it will accept a full load. After fire-forming, the shortened ·30-40 cases are loaded just as the ·444s; 7·0 grains of Unique, card wad, filler wad, shot, over-shot wad, and crimp.

While both the above calibers can be reloaded with standard ·45 Colt and ·44 Magnum dies, the job will be easier if you have a special set made up by RCBS. For this purpose, simply send two or three of your fired cases along with your order and explain how the cases are to be used. I have several special sets of similar RCBS dies and they have all worked quite well.

The ·45 and ·44 loads just described will deliver one-half ounce or more of shot quite well from ·45 Colt or ·44 Special/Magnum guns with altered chambers. However, often one might wish to do the same thing with a ·45 ACP M1917 revolver. In this instance, the two cases used will not headspace correctly. Both ·444 and ·30-40 rims are a good deal thinner than the rim-plus-clip thickness for which the guns were made.



The above photo shows the sequence of forming ·30-40 (left) and ·30-06 brass into rimmed and rimless cylinder-length shotshell cases for use in ·45 revolvers. Note case at extreme right has been fully fireformed, resized, and reloaded.

Fortunately, this problem is easily surmounted, and the M1917 guns are probably the simplest and least costly to modify of all. Simply shorten ·30-06 or ·308 Winchester (or any other similar rimless case of same head diameter) to cylinder length and then give the same treatment as was given to the ·30-40 earlier. Assemble these in groups of three in half-moon clips originally intended for the M1917 revolvers, chamber, and fire-form. Of course, before this, you will have opened up the chamber throats as detailed earlier. After fire-forming, the cutoff ·30-06 cases may be loaded as for the ·444s above.

These heavy shot loads will produce a goodly amount of pellet deformation as the naked lead spheres are driven down and over the rifling lands. Even when a choke tube is used, this will produce some rather sketchy patterns with a lot of flyer shot off to the side. This can be eliminated by cutting strips of polyethylene film to encircle the inside of the case exactly twice, and inserting these strips on top of the filler wad before adding the shot charge. Just as it does in the Winchester Mark V shotshell, this layer of polyethylene will protect and cushion the shot against the rifling and greatly reduce deformation.

As said before, when these cylinder-length cases are used in conjunction with a smooth choke tube, and if polyethylene shot wrappers are added, your revolver will deliver patterns and range very nearly equal that of standard ·410 gauge field loads. These alterations and loadings elevate your big-bore sixgun from simply a snake killer to a level where it may be relied upon to take running cottontails, squirrels, and similar small game, to include birds on the wing if you're sharp enough—at ranges out to 20 or 25 yards.

Unless you wish to retain one gun purely for use with shotshells, I would recommend that a spare cylinder be obtained and that it be used for the modified chambers. Then, when scatter-gunning is your bent, install that cylinder, replacing it with the standard cylinder when you want to remove the choke tube and shoot ball ammunition.

In years gone by 'smiths occasionally reamed the rifling from handgun barrels, thus converting them to smoothbores for shot loads. This produced substantially better performance from shot loads of the day, eliminating the deleterious effect of the rifling. Unfortunately, this is no longer lawful. Rulings by the BATF in the 1950s classified a smooth-bored revolver or other handgun as a "sawed off" shotgun, placing it within the restrictions of what is now GCA'68. As a result, any such gun must be registered with the BATF and the appropriate fee paid. Consequently, one is better advised to leave the rifling in and thus eliminate the possibility of future unpleasantness.

I have been advised, however, by agents of BATF that so long as a portion of the original rifling is left unaltered, the gun will not be classified as a sawed-off shotgun. This could change, though, and there is no rule saying just how much rifling must be left unaltered to keep the gun from becoming a sawed-off shotgun. Consequently, I'd recommend against this approach.

CHAPTER 30 - Handguns for the Handicapped

There was a time when few handicapped people could ever expect to shoot. Today there is much emphasis on enabling handicapped persons to participate in virtually every field. Handgunning is no exception, and the means involve technique as often as special guns. For that reason we'll discuss both here.

First, let's dispense with waist-down handicaps. Since handguns are primarily one-hand arms, the individual deprived of leg function need only sit in his wheelchair or auto seat, and shoot in the conventional manner. Nothing special in technique, gun, or ammunition is required unless further handicaps exist.

In these days of low-cost corrective lenses and plentiful optometrists, faulty vision is generally no longer a sound reason for not shooting. All the same, there are many with severe vision losses who might shoot if they only realized they could. The key lies in having a special lens ground for the master eye—one that will give the sharpest possible definition at about 30 inches (where the sights are in the extended-arm position) and still yield a recognizable target image at some reasonable shooting range. Targets really need be no more than ten yards distant, and even a very indistinct target image is suitable. Even if nothing but a fuzzy black mass can be seen over the sights, respectable shooting can be done.

Developing such lenses is the optometrists field, not ours, and in many cases he can do so. The only way to be certain is to visit with him, show him a handgun, and let him take it from there.

People generally feel handguns take two hands for operation, even if firing is done with one hand. Thus, loss of a hand or arm can interfere seriously. Years ago, I ran across a Colt ·45 Auto modified for use by a one-armed shooter. A broad steel lug had been silver-soldered to the left side of the slide, and its front face serrated. Grasping the gun in his only hand, the owner could retract the slide by placing the lug against any handy surface, and shoving the gun forward—he could even jam the lug against his leg or boot heel and get the job done. This served for jacking a round into the chamber, for locking the slide open on an empty magazine, clearing a misfire, or any of the other purposes for which a slide is retracted. Loading required no gun alterations. With the slide locked back, he merely shoved the gun into the front of his waistband, then extracted a loaded magazine from his hip pocket, shoved it into the butt, withdrew the gun, then depressed the slide stop to chamber the first round—all with his one good hand.

This could be done with any auto, thus adapting it to one-hand operation. Additionally, funneling the magazine well might simplify loading, and extending the slide stop rearward would simplify dropping the slide. As for loading magazines, almost anyone can learn to thumb cartridges into place with one hand when the magazine butt is rested on a solid surface.

In regard to removing an empty magazine, the one-hander will have no trouble with the Colt-style button release behind the trigger. Butt catches are an impossibility, though, unless the gun is jammed in the waistband, then it's no problem to work the catch one-handed. Another solution to butt-catch operation would be an extension welded on and shaped so it could be operated by pressure against one's leg, hip, or another object.

Thumb-cocking either revolver or auto becomes impossible if a joint of the shooting thumb is gone, even though the gun can still be held solidly. A sharply-checkered or serrated extension on the hammer spur allows cocking by forcing it against one's leg or any convenient object. In fact, cavalry troops were once taught this method of cocking with standard guns, on the assumption that the off hand would be busy controlling the horse at the time the gun was needed. I once knew a fellow who said his thumb-less but vigorous uncle cocked his SA Colt by means of a silk-cord lanyard tied 'round the hammer spur and clenched in his teeth.

British troops were once taught to reload their top-break Webley revolvers one-handed by first thumbing the latch down, and opening the gun with a vigorous wrist-snap that tossed the empties clear— followed by jamming the muzzle into their belt, dropping cartridges into the cylinder, then wrist-snapping the gun shut as it was plucked out.

A variation of this works one-handed with modern swing-out cylinder revolvers. Thumb the latch and press the cylinder open with the trigger finger. Drop and regrasp the gun with the forefinger over the ejector rod and give it a shove to dump out the empties. Shoving the rod against any convenient object should do as well. For the rest, the British method works quite well, though some might prefer to wedge the revolver between the legs as is taught by some police departments.

If the first joint of the trigger finger is missing, the trigger can usually still be manipulated for SA fire if the side is built outward a bit. Sometimes merely fitting a trigger shoe or a wide trigger will solve the problem.

When the trigger finger is missing completely, the hand need merely be shifted upward on the gun until the index finger can be used on the trigger. Reshaping the grips will help in such instances, especially if a slight shelf is formed beneath the little finger to allow a stronger grip with the two fingers remaining.

In any instance where fingers or portions thereof are missing, carving a wraparound style grip will make for a secure hold. This is best done by building up the original grips with plastic wood or similar material until the desired effect is obtained, then carving a duplicate of the special grip in wood. This is ideally done by someone equipped with a pantograph which will machine-carve a more precise copy than can be whittled out by hand.

When wrists are weak but both hands are available, simply shoot two-handed. Otherwise, a leather or elastic wristband will help. Also, a spoon-like extension attached to butt or grips and extending back under the wrist will provide much additional support.

If the entire arm is too weak to support the gun, a simple length of dowel rubber-banded to wrist or gun butt can be jammed into one's belt or bulge to steady the gun. A rod of this sort could be attached permanently to the gun butt by a ball and socket joint or simple pivot. The lower end could then be jammed into the belt, ground, or other surface and the gun brought to bear on target, well supported.

These are only samples of what can be done to allow handicapped people to shoot handguns. The possibilities are endless. If one keeps an open mind and examines the problem carefully, many, many handicapped persons can be fitted with modified guns, accessories, and shown techniques that will enable them to enjoy shooting—shooting of all sorts, not just handguns.

Appendix I

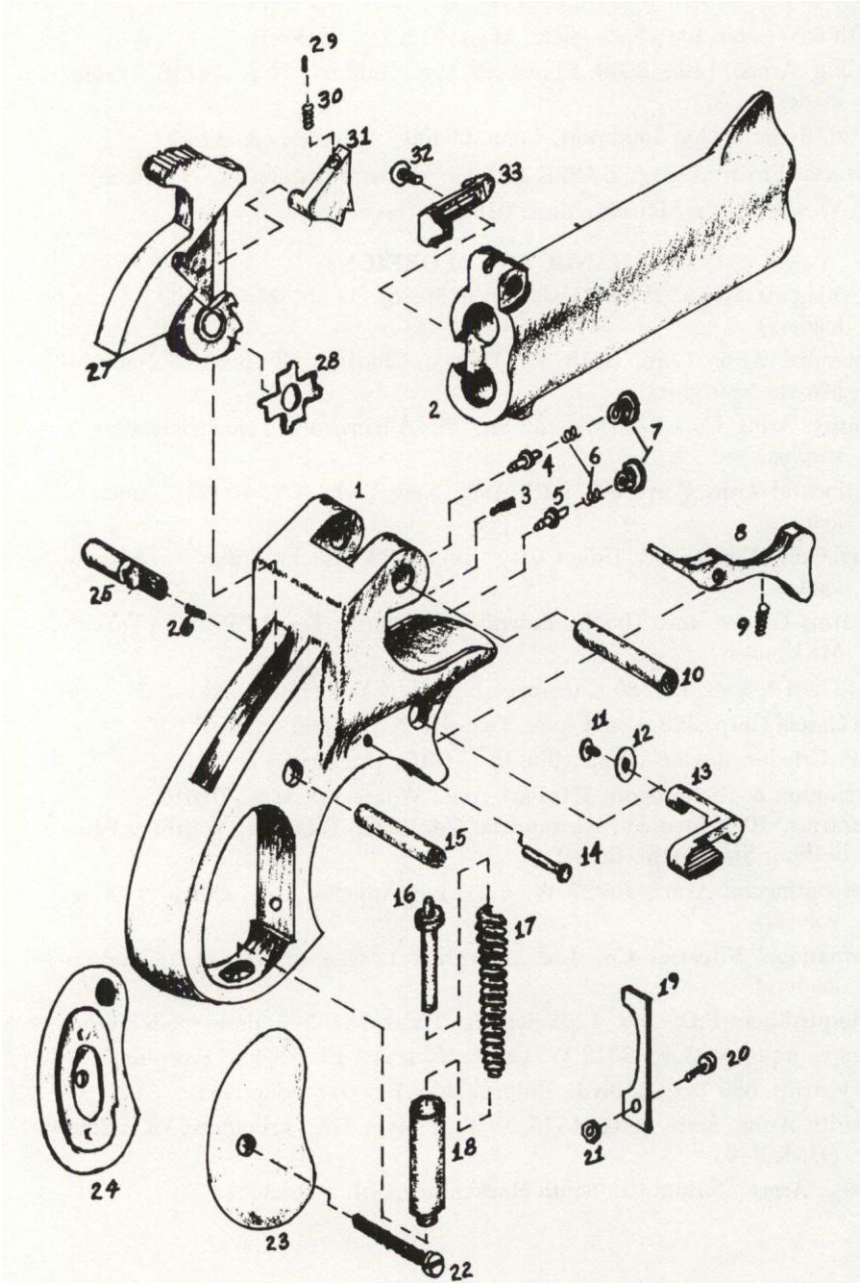
HANDGUNS—MAKERS, IMPORTERS, TYPICAL MODELS AND PARTS IDENTIFICATION

HANDGUNS (U. S. -MADE)

Charter Arms Corp. 265 Asylum, Bridgeport, Conn. 06610 (revolvers)
Chicago Derringer Corp., Box 54, Bensenville, 111. 60106 (reproductions)
Colt's, 150 Huyshope Ave., Hartford, Conn. (various)
Firearms Intl. Corp. 4837 Kerby Hill Rd., Washington, D. C. 20022 (Regent)
Harrington & Richardson, 320 Park Ave., Worcester, Mass. 01610 (revolvers)
High Standard Mfg. Co., 1811 Dixwell Ave., Hamden, Conn. 06514 (revolvers & autos)
Indian Arms, 13503 Jos. Campau Ave., Detroit, Michigan 48212 (stainless autoloaders)
Iver Johnson Arms & Cycle Works, Fitchburg, Mass. 01420 (top-break revolvers)
Navy Arms, 689 Bergen Blvd., Ridgefield, N. J. (reproductions)
Numrich Arms Corp. W. Hurley, N. Y. (muzzleloaders)
Rocky Mountain Arms, 360 West 600 South, Salt Lake City, Utah, 84110 (revolvers)
Smith & Wesson, Inc., Springfield, Mass. 01101 (various)
Sterling Arms, Ltd., 2209 Elmwood Ave., Buffalo, N. Y. 14216 (autoloaders)
Sturm, Ruger & Co., Southport, Conn. 06490 (revolvers & autos)
Universal Firearms Corp. 3746 E 10th Ct. Hialeah, Fla. 33011 (various) Dan Wesson Arms, Monson, Mass. 01057 (revolvers)

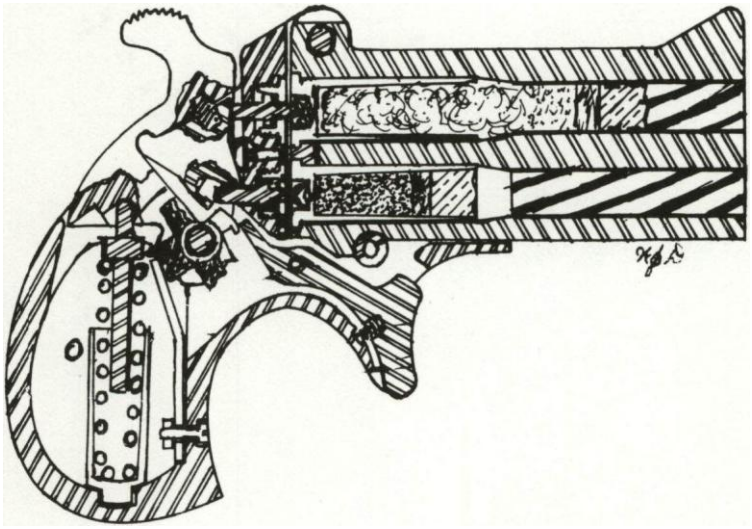
HANDGUNS (FOREIGN)

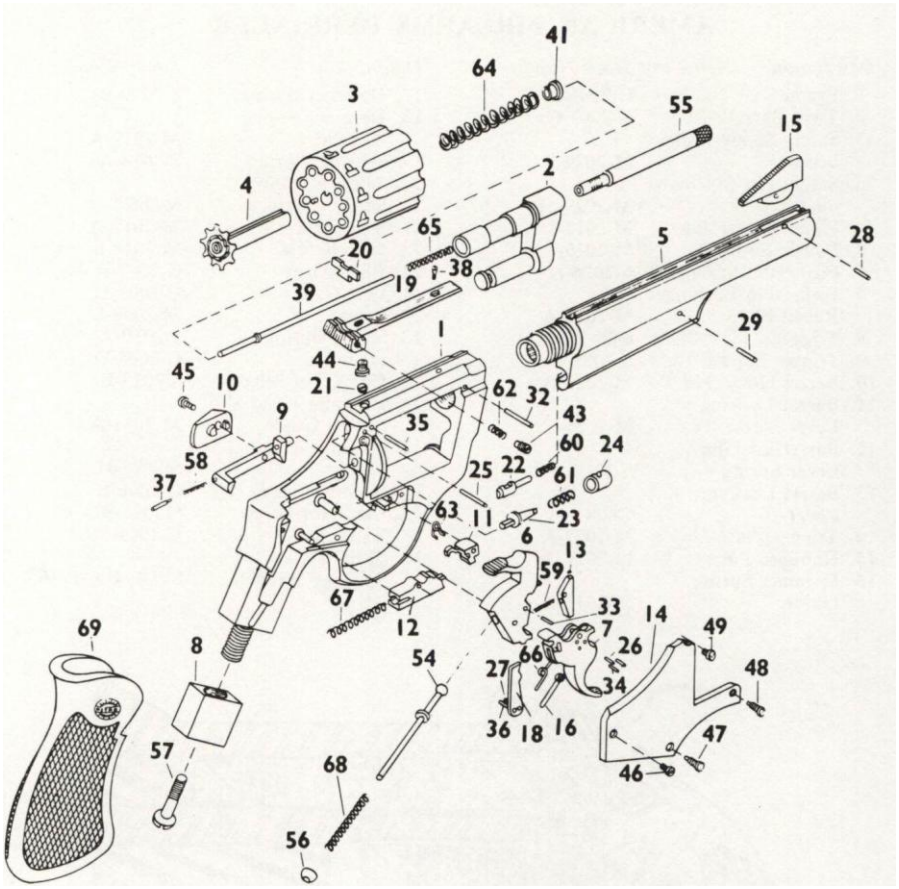
Browning Arms Co., 1706 Washington St., St. Louis, Mo. 63103 (autoloaders)
Centennial Arms Corp. 3318 W. Devon, Chicago, 111. 60645 (muzzle- loaders & surplus)
Century Arms Co., 3-5 Federal St., St. Albans, Vt. (muzzleloaders & surplus)
Continental Arms Corp. 697 Fifth Ave., New York, N. Y. 10022 (muzzle- loaders)
Dixie Gun Works, Inc. Union City, Tenn. ("Kentucky" rifles) (muzzle- loaders)
Firearms Center, Inc. 705 E. Lawndale, Victoria, Texas 77901 (Turkish MKE autos)
J. L. Galef & Sons, Inc. 85 Chambers, N. Y. 7, N. Y. (revolvers)
The Garcia Corp, 329 Alfred Ave., Teaneck, N. J. 07666 (see F. I.)
H. F. Grieder, Box 487, Knoxville, 111. (SIG, Hammerli)
Harrington & Richardson, 320 Park Ave., Worcester, Mas., 01610
Interarms, 10 Prince St., Alexandria, Va. 22313 (Mauser, Walther, Parabellum, Star, Astra, Rossi)
Intercontinental Arms, 10927 W. Pico, Los Angeles, CA. 90064 (SA revolvers)
International Firearms Co., Ltd., Montreal 1, Quebec, Canada (muzzle- loaders)
Kleinquenther, P. O. Box 1261-Seguin, Texas 78155 (Bemardelli autos)
Mars Equipment Corp. 3318 W. Devon, Chicago, 111. 60645 (surplus)
Navy Arms, 689 Bergen Blvd., Ridgefield, N. J. (reproduction)
Security Arms, Suite 1004, 1815 N. Fort Myer Dr., Arlington, Va. 22209 (H&K P-9)
Stoegei Arms, 55 Ruta Ct., South Hackensack, N. J. (Llama)



AMERICAN FIREARMS DERRINGER

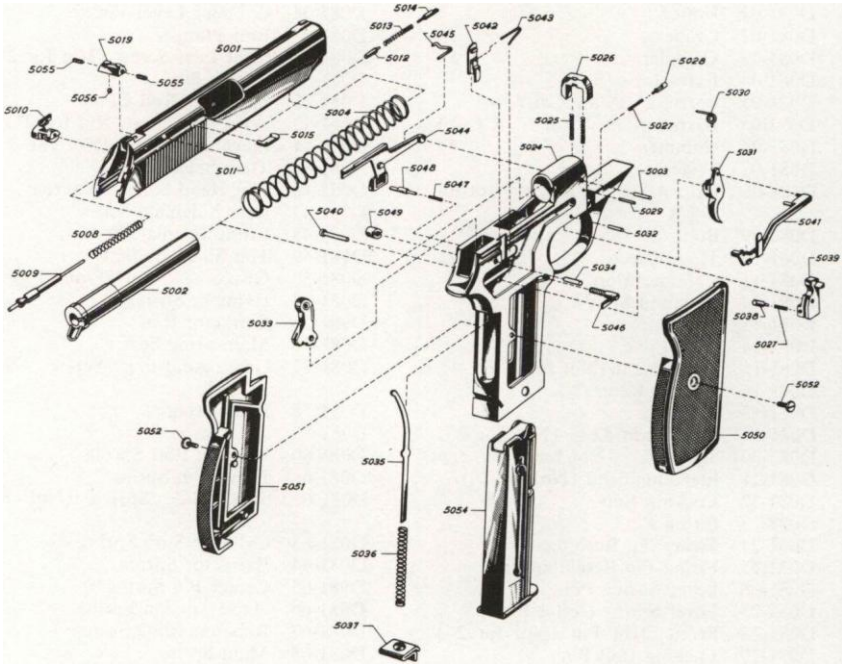
Description		Stock Number	Description	Stock Number
1.	Frame	C-2001-B	17. Hammer Spring	S-2019-B
2.	Twin Barrel	C-2003-C	18. Hammer Spring Housing	M-2012-A
3.	Safety Screw (Allen Screw	M-2029-B		
			19. Selector Spring	S-2014-A
3a.	Safety Pin (Spring pin)	M-2029-SP	20. Selector Spring Screw	M-2022-A
4.	Upper Firing Pin	M-2015-U	21. Selector Spring Nut	M-2017-A
5.	Lower Firing Pin	M-2015-L	22. Grip Screw	M-2018-B
6.	Firing Pin Spring	S-2024-A	23. Right Grip	C-2007-R
7.	Firing Pin Bushing/ Recoil Plate	M-2016-A	24. Left Grip	C-2007-L
			25. Safety	M-2008-B
8.	Trigger	C-2002-C	26. Safety Spring	S-2030-A
9.	Trigger Spring	S-2025-T	27. Hammer	C-2005-D
10.	Barrel Hinge Pin	M-2020-B	28. Firing Pin Selector	S-2013-B
11.	Barrel Locking Lever Screw	M-2021-C	29. Hammer Head Spring Guide	M-2031-A
12.	Barrel Locking Lever Spring	S-2010-A	30. Hammer Head Spring	S-2025-H
13.	Barrel Locking Lever	C-2009-A	31. Hammer Head	C-2006-B
			32. Extractor Screw	S-2023-B
14.	Trigger Pin	M-2027-A	33. Extractor	C-2004-B
15.	Hammer Pin	M-2028-A	34. SPECIAL:	
16.	Hammer Spring Guide	M-2011-A	Spanner Wrench	SW-1/4 x 1/16





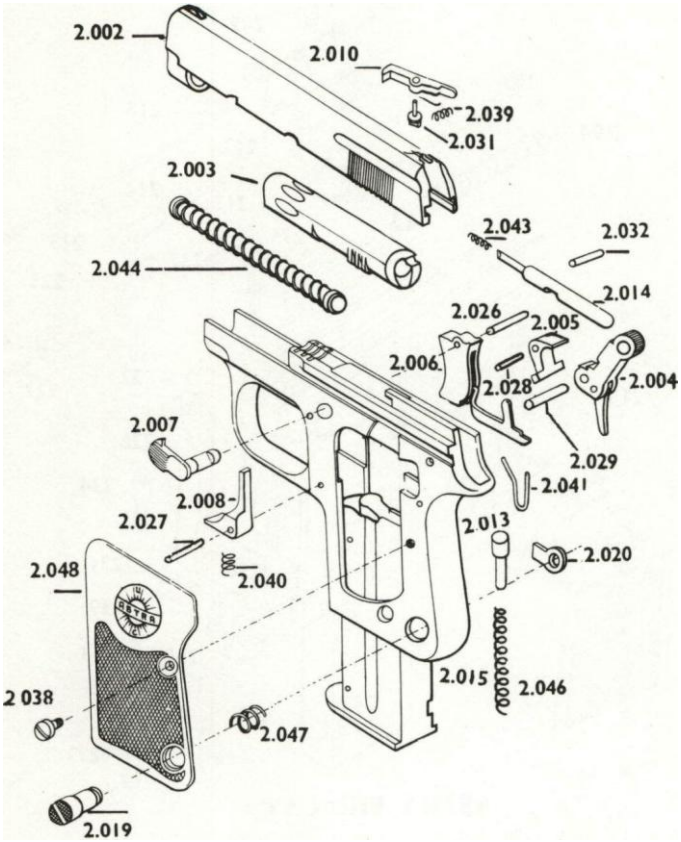
ASTRA “CADIX”

Part No.	Description	Part No.	Description
D081-01	Frame	D081-36	Cylinder Lever Pin
DO 81-02	Crane	D081-37	Bolt Plunger
D081-03	Cylinder	D081-38	Sight Leaf Screw (Not for 2″)
D081-04	Extractor	D081-39	Center Pin
D081-05	Barrel 2″ (State Cal.)	D081-41	Extractor Rod Collar
D081-05	Barrel (State 4″ or 6″ & Cal.)	D081-43	Windage Screw (Not for 2″)
DO 81-06	Hammer	D081-44	Elevation Screw (Not for 2″)
DO 81-07	Trigger	D081-45	Thumbpiece Screw
D081-08	Grip Adjusting Block (Not for 2″)	D081-46	Flat Head Sideplate Screw
		D081-47	Rear Sideplate Screw
D081-09	Bolt	D081-48	Front Sideplate Screw
D081-10	Thumbpiece	D081-49	Top Sideplate Screw
D081-11	Cylinder Stop	D081-50	Grip Screw (for 2″ only)
D081-12	Rebound Slide	D081-54	Hammer Strut
D081-13	Sear	D081-55	Extractor Rod
D081-14	Slide Plate	D081-56	Mainspring Seat
D081-15	Front Sight (Not for 2″)	D081-57	Grip Adjusting Screw (Not 2″)
D081-16	Trigger Lever		
D081-18	Hand	D081-58	Bolt Spring
D081-19	Rear Sight Leaf (Not for 2″)	D081-59	Sear Spring
DO 81-20	Sight Slide (Not for 2″)	D081-60	Locking Bolt Spring
D081-21	Elevating Stud (Not for 2″)	D081-61	Firing Pin Spring
D081-22	Locking Bolt	D081-62	Sight Slide Spring (Not for 2″)
D081-23	Firing Pin		
D081-24	Firing Pin Bushing	D081-63	Cylinder Stop Spring
D081-25	Firing Pin Retaining Pin	D081-64	Extractor Spring
D081-26	Lever Spring Pin	D081-65	Center Pin Spring
DO 81-27	Lever Spring Collar Pin	D081-66	Hand Torsion Spring
D081-28	Front Sight Pin (Not for 2″)	D081-67	Rebound Slide Spring
D081-29	Locking Bolt Pin	D081-68	Main Spring
D081-32	Barrel Pin	D081-69	One-piece Grip, Brown
D081-33	Sear Pin	D081-69	Wood Grips for 2″
D081-34	Hand Torsion Spring Pin		Rod for cleaning
D081-35	Firing Pin Bushing Retaining Pin		



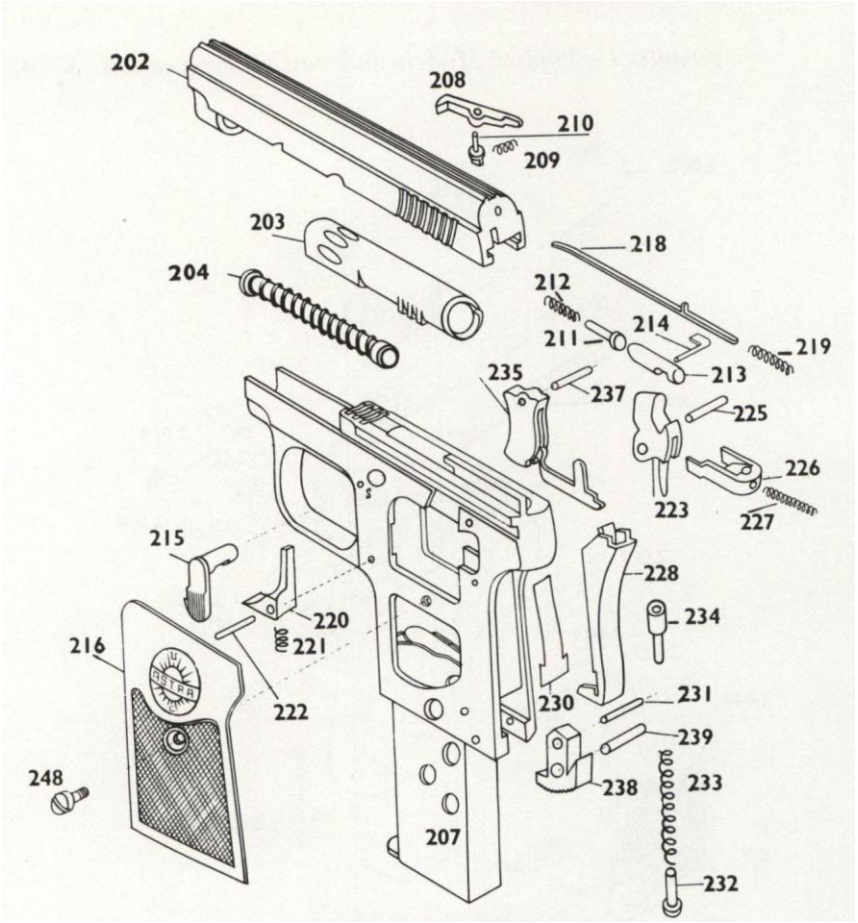
ASTRA CONSTABLE

Part No.	Description	Part No.	Description
C-5001	Slide	C-5034	Hammer pin
C-5002	Barrel	C-5035	Hammer strut
C-5003	Barrel pin	C-5036	Main spring
C-5004	Recoil spring	C-5037	Main spring seat
C-5008	Firing pin spring	C-5038	Sear plunger
C-5009	Firing pin	C-5039	Sear
C-5010	Safety	C-5040	Sear pin
C-5011	Firing pin retaining pin	C-5041	Sear bar
C-5012	Safety plunger	C-5042	Disconnector
C-5013	Extractor spring	C-5043	Disconnector spring
C-5014	Extractor retainer	C-5044	Slide retainer
C-5015	Extractor	C-5045	Slide retainer spring
C-5019	Rear sight	C-5046	Magazine catch
C-5024	Frame	C-5047	Magazine catch spring
C-5025	Takedown yoke spring	C-5048	Magazine button plunger
C-5026	Takedown yoke	C-5049	Magazine catch button
C-5027	Sear plunger spring	C-5050	Right grip
C-5028	Takedown plunger	C-5051	Left grip
C-5029	Takedown yoke pin	C-5052	Grip screws
C-5030	Trigger spring	C-5054	Magazine
C-5031	Trigger	C-5055	Rear sight screw
C-5032	Trigger pin	C-5056	Rear sight bead
C-5033	Hammer		



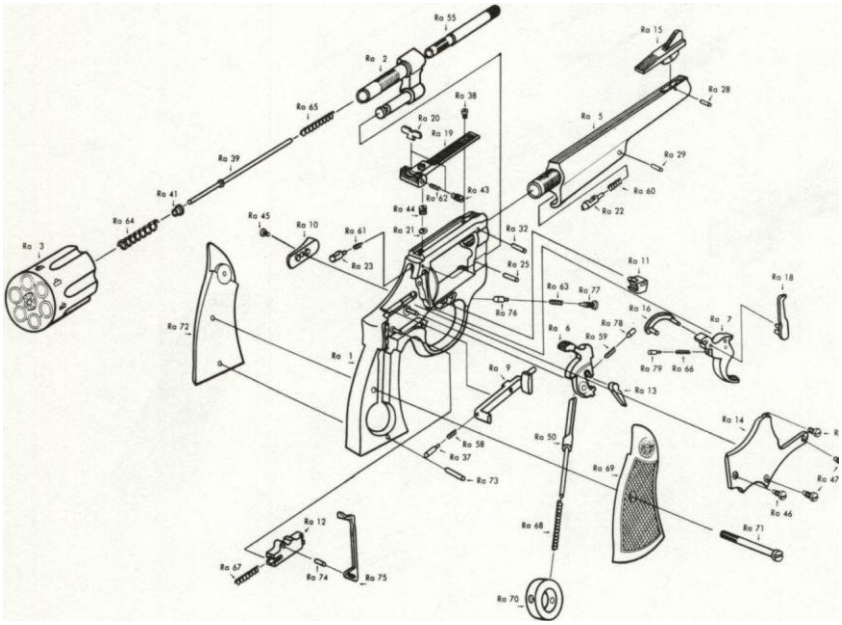
ASTRA “CUB” & “CAMPER”

Part No.	Description	Part No.	Description
2002	Slide	2026	Trigger Pin
2002C	Slide, Chrome	2027	Magazine Safety Pin
2003	Barrel for Cub	2028	Sear Pin
2003-4C	Barrel 4″ Chrome (Camper)	2029	Hammer Pin
2003-4″	Barrel 4″ (Camper)	2031	Extractor Pin
2004	Hammer w/Strut & Pin	2032	Firing Pin Retaining Pin
2005	Sear	2038	Grip Screw
2006	Trigger w/Disconnector	2038C	Grip Screw, Chrome
2007	Thumb Safety	2039	Extractor Spring
2007C	Thumb Safety (Chr.)	2040	Magazine Safety Spring
2008	Magazine Safety	2041	Sear Spring
2010	Extractor	2043	Firing Pin Spring
2044	Recoil Spring Assembly	2046	Hammer Spring
2013	Hammer Spring Guide	2047	Magazine Catch Spring
2014	Firing Pin	2048	Grip Plates
2015	Magazine	2048P	Grip Plates, Pearl
2019	Magazine Catch Button	2048W	Grip Plates, Wood
2020	Magazine Catch		



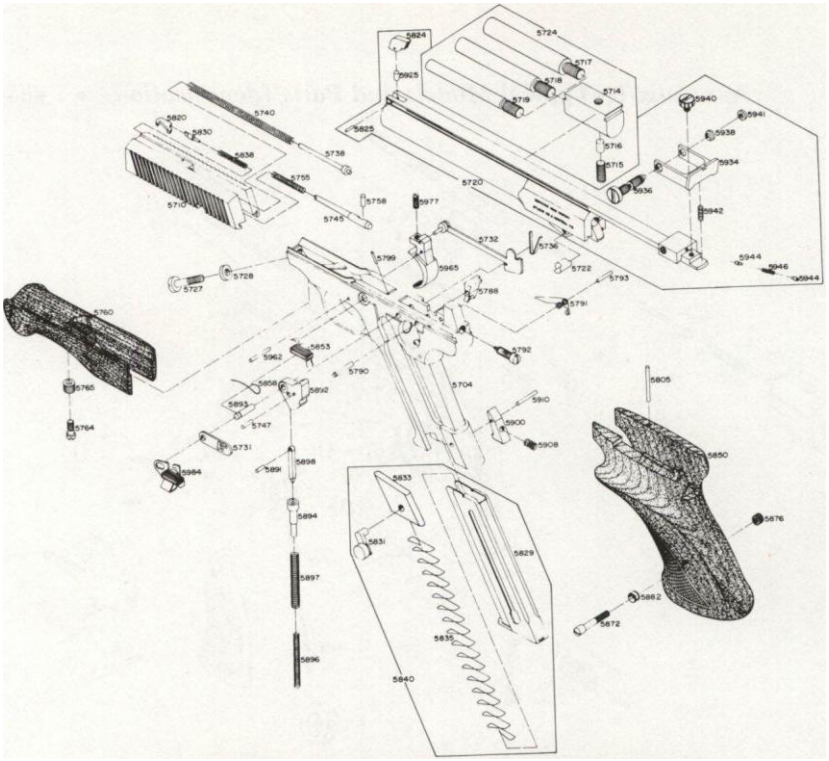
ASTRA FIRECAT

Part No.	Description	Part No.	Description
202	Slide	222	Magazine safety pin
202c	Slide, Chrome	223/24	Hammer & hammer rod
203	Barrel	225	Hammer pin
204	Action Spring	226	Hammer release
207	Magazine	227	Hammer release spring
208	Extractor	228/29	Grip safety lever & grip safety rod
209	Extractor spring		
210	Extractor pin	230	Spring of grip safety
211	Pin for firing pin	231	Safety catch pin
212	Firing pin spring	232	Base of hammer spring
213	Rod of firing pin	233	Hammer Spring
214	Pin of firing pin rod	234	Rod of hammer spring
215	Thumb safety	235	Trigger, trigger connecting rod & pin of trigger connecting rod
215c	Thumb safety, chrome		
216	Grip plates		
216P	Imitation pearl grips or Sim.	237	Trigger pin
216N	Rosewood grips	238	Magazine catch
218	Signal pin	239	Butt of trigger spring
219	Signal pin safety	248	Screws for grip plates, pair
220	Magazine Safety	248c	Screws for grip plates, chrome, pair
221 6/22/65	Spring of magazine safety		



ASTRA 357

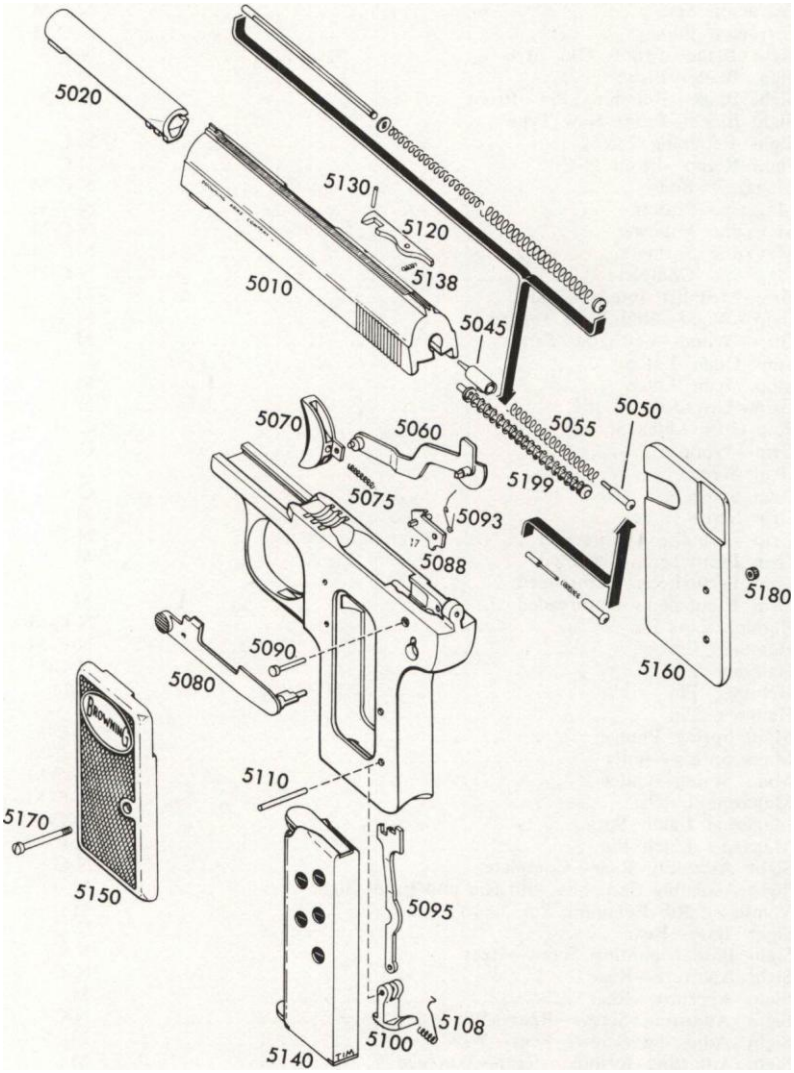
Part No.		Description	Part No.		Description
Ra	1	Frame	Ra	43	Windage screw
Ra	2	Crane	Ra	44	Elevator screw
Ra	3	Cylinder with extractor and pins	Ra	45	Thumbpiece screw
			Ra	46	Flat head sideplate screw
Ra	5	Barrel	Ra	47	Front lower sideplate screw
Ra	6	Hammer	Ra	49	Top sideplate screw
Ra	7	Trigger	Ra	50	Hammer strut
Ra	9	Bolt	Ra	55	Extractor rod
Ra	10	Thumbpiece	Ra	58	Bolt spring
Ra	11	Cylinder stop	Ra	59	Sear spring
Ra	12	Rebound slide	Ra	60	Locking bolt spring
Ra	13	Sear	Ra	61	Firing pin spring
Ra	14	Slide plate	Ra	62	Sight slide spring
Ra	15	Front sight	Ra	63	Cylinder stop spring
Ra	16	Trigger lever	Ra	64	Extractor spring
Ra	18	Hand	Ra	65	Center pin spring
Ra	19	Rear sight leaf	Ra	66	Hand torsion spring
Ra	20	Sight slide	Ra	67	Rebound slide spring
Ra	21	Screw plate of rear sight leaf elevator	Ra	68	Hammer spring
			Ra	69	Right grip
Ra	22	Locking bolt	Ra	70	Regulation ring
Ra	23	Firing pin	Ra	71	Holder grip screw
Ra	25	Firing pin retaining pin	Ra	72	Left grip
Ra	28	Front sight pin	Ra	73	Holder grip pin
Ra	29	Locking bolt pin	Ra	74	Safety pin
Ra	32	Barrel pin	Ra	75	Safety
Ra	37	Bolt plunger	Ra	76	Cylinder stop plunger
Ra	38	Sight leaf screw	Ra	77	Cylinder stop screw
Ra	39	Central pin	Ra	78	Sear plunger
Ra	41	Extractor rod collar	Ra	79	Hand plunger



BROWNING ·22 CAL. AUTO PISTOL
(N—Nomad; C—Challenger; M—Medalist)

Code No.	Description	Model
5710	Slide	N-C-M
5711	Barrel with Front Sight and Rear Sight Assem. Complete 4½″	N-C-M
5713	Barrel with Front Sight and Rear Sight Assem. Complete 6¾″	N-C-M
5720	Barrel with Front Sight and Rear Sight Assem. Complete with Ventilated Rib	N-C-M
5721	Barrel Medalist International 5·9″	N-C-M
5722	Barrel Guide Pin	N-C-M
5714	Counterweight Support—2·41 oz	M
5715	Counterweight Support Screw	M
5716	Counterweight Support Bushing	M
5717	Counterweight 2·52 oz	M
5718	Counterweight 1. 79 oz	M
5719	Counterweight. 94 oz	M
5724	Counterweight Support and Weights (Complete Set)	M
5726	Barrel Mounting Screw	N-C
5727	Barrel Mounting Screw	M
5728	Barrel Mounting Screw Washer	N-C-M
5730	Click Plate	N
5731	Click Plate	C-M
5732	Disconnector	N-C-M
5736	Disconnector Spring	N-C-M
5738	Recoil Spring Guide	N-C-M
5740	Recoil Spring	N-C-M
5745	Firing Pin	N-C-M
5747	Fire Pin—For Dry Firing	M
5755	Firing Pin Spring	N-C-M
5758	Firing Pin Retaining Pin	N-C-M
5760	Forearm	M
5764	Forearm Screw	M
5765	Forearm Screw Escutcheon	M
5788	Sear	N-C-M
5790	Sear Pin	N-C-M
5791	Sear Spring	C-M
5793	Sear Spring Pin	C-M
5794	Sear Spring	N
5799	Ejector	N-C-M
5805	Ejector Deflection Pin	M
5820	Extractor	N-C-M

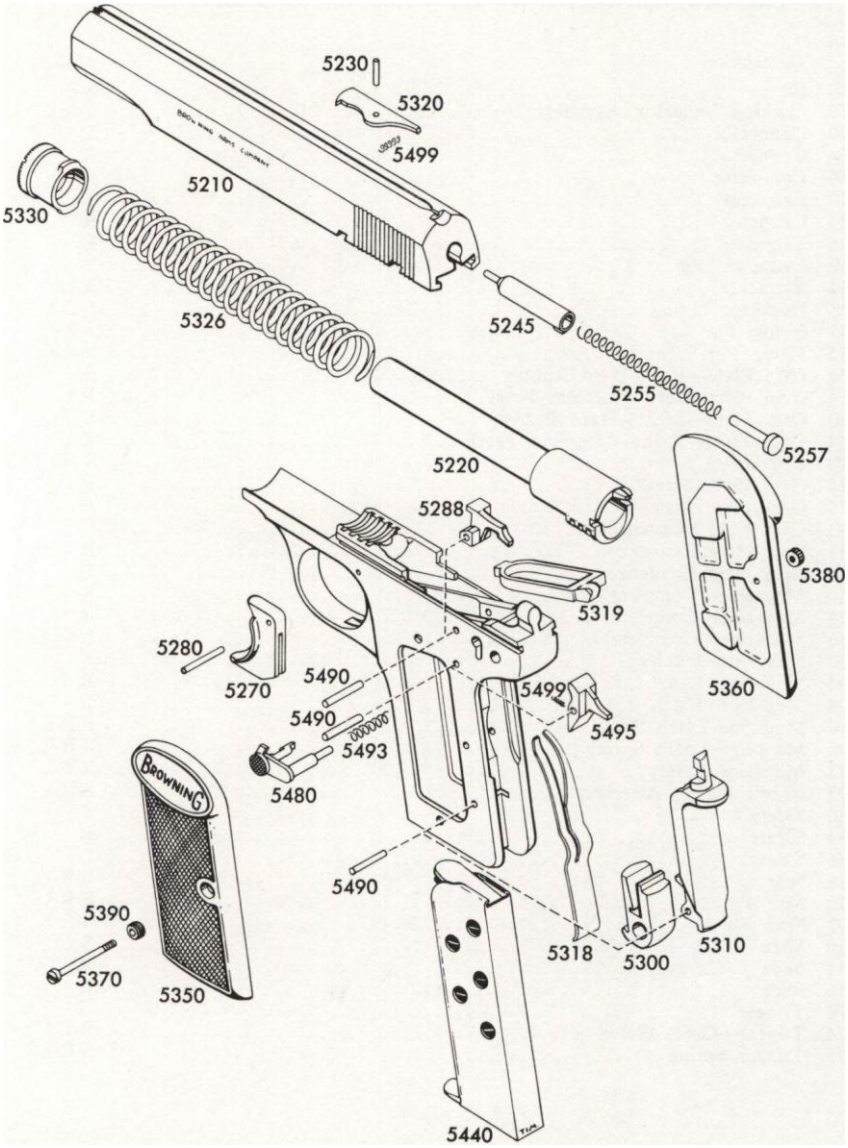
5838	Extractor Spring	N-C-M
5830	Extractor Plunger	N-C-M
5821	Sight Blade—Front—Old Style	N-C
5824	Sight Blade—Front	M
5825	Sight Blade—Retaining Pin—Front	M
5826	Sight Blade—Front New Type	N-C
5827	Sight Retaining Pin	N-C
5828	Sight Ramp—Front N-C	N-C
5829	Magazine Body	N-C-M
5831	Magazine Button	N-C-M
5833	Magazine Follower	N-C-M
5835	Magazine Spring	N-C-M
5840	Magazine Complete	N-C-M
5849	Grip Medalist International	M
5850	Grip—Wood—Righthand Target	M
5851	Grip—Wood—Lefthand Target	M
5852	Stop Open Latch	C
5853	Stop Open Latch	M
5854	Grip—Novadur—Plastic	N
5858	Stop Open Latch Spring	C-M
5860	Grip—Wood	C
5868	Grip Screw	N
5870	Grip Screw	C
5872	Grip Screw	M
5874	Grip Escutcheon Threaded	N-C
5876	Grip Escutcheon Threaded-	M
5880	Grip Escutcheon Unthreaded	C
5882	Grip Escutcheon Unthreaded	M
5891	Hammer Link Pin	N-C-M
5898	Hammer Link	N-C-M
5892	Hammer	N-C-M
5893	Hammer Pin	C-M
5895	Hammer Pin	N
5894	Main Spring Plunger	N-C-M
5896	Main Spring-Inner	N-C-M
5897	Main Spring-Outer	N-C-M
5900	Magazine Latch	N-C-M
5908	Magazine Latch Spring	N-C-M
5910	Magazine Latch Pin	N-C-M
5921	Sight Assembly Rear—Complete	N-C
5924	Sight Assembly Complete with Rib and Front Sight	M
5925	Ventilated Rib Retaining Pin	M
5927	Sight Base-Rear	N-C
5931	Sight Base Mounting Screw—Rear	N-C
5933	Sight Aperture—Rear	N-C
5934	Sight Aperture—Rear	M
5935	Sight Adjusting Screw—Rear—Windage	N-C
5936	Sight Adjusting Screw—Rear—Windage	M
5938	Sight Adjusting Bushing—Rear—Windage	M
5941	Sight Adjusting Washer—Rear—Windage	M
5939	Sight Adjusting Screw—Rear—Elevation	N-C
5940	Sight Adjusting Screw—Rear—Elevation	M
5942	Sight Tension Spring—Elevation	M
5944	Sight Adjusting Screw Follower—Windage or Elevation	M
5946	Sight Adjusting Screw Follower Spring—Windage & Elev	M
5970	Trigger-Blued	N
5965	Trigger—Gold Plated—with Backlash Screw	C-M
5962	Trigger Pin	N-C-M
5977	Trigger Backlash Adjustment Screw	C-M
5792	Trigger Pull Adjustment Screw	C-M
5980	Safety	N-C
5984	Safety	M



BROWNING ·25 CALIBER AUTOMATIC PISTOL
(S—PRE-1969 STANDARD; R—RENAISSANCE; L—LIGHTWEIGHT)

Code No.	Description	Model
5020	Barrel	S-R-L
5050	Cocking Indicator Assembly	S-R-L
5060	Connector	S
5064	Connector	R
5066	Connector	L
5120	Extractor	s
5124	Extractor	R
5126	Extractor	L
5130	Extractor Pin	S
5134	Extractor Pin	R-L
5138	Extractor Spring	S-R-L
5045	Firing Pin	S-R-L
5055	Firing Pin Spring	S-R-L
5150	Grip Plate—Left—Hard Rubber	S
5154	Grip Plate—Left—Nacrolac Pearl	R-L
5160	Grip Plate—Right—Hard Rubber	S
5164	Grip Plate—Right—Nacrolac Pearl	R-L
5170	Grip Plate Screw	S
5174	Grip Plate Screw	R
5176	Grip Plate Screw	L
5180	Grip Plate Escutcheon	S
5184	Grip Plate Escutcheon	R
5186	Grip Plate Escutcheon	L
5140	Magazine—Complete	S
5144	Magazine—Complete	R
5146	Magazine—Complete	L
5100	Magazine Latch	S

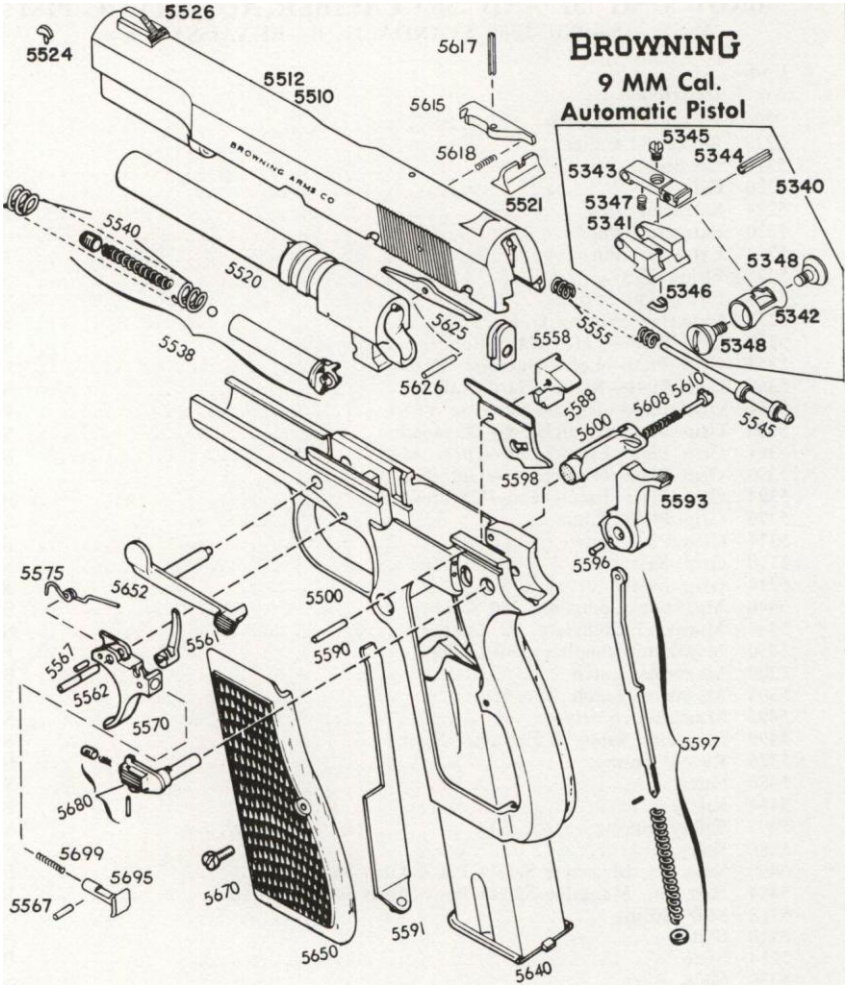
5104	Magazine Latch	R
5106	Magazine Latch	L
5110	Magazine Latch Pin	S-R-L
5108	Magazine Latch Spring	S-R-L
5095	Magazine Safety	S-R-L
5199	Recoil Spring Assembly	S-R-L
5080	Safety	S
5084	Safety	R
5086	Safety	L
5088	Sear	S-R-L
5090	Sear Pin	S-R-L
5093	Sear Spring	S-R-L
5010	Slide	S
5014	Slide	R
5016	Slide	L
5070	Trigger	S
5074	Trigger-Gold Plated	R-L
5075	Trigger Spring	S-R-L



BROWNING ·32 AND ·380 CALIBER AUTOMATIC PISTOL
(S—PRE-1969 STANDARD; R—RENAISSANCE)

Code No.	Description	Model
5220	Barrel ·380 Caliber	S-R
5223	Barrel ·32 Caliber	S-R
5319	Connector	S-R
5320	Extractor	S
5224	Extractor	R
5230	Extractor Pin	S
5234	Extractor Pin	R
5245	Firing Pin	S-R
5255	Firing Pin Spring	S-R
5257	Firing Pin Spring Guide	S-R
5350	Grip Plate—Left—Hard Rubber	S
5354	Grip Plate—Left—Nacrolac Pearl	R
5360	Grip Plate—Right—Hard Rubber	S
5364	Grip Plate—Right—Nacrolac Pearl	R
5380	Grip Plate Escutcheon—Threaded	S
5384	Grip Plate Escutcheon—Threaded	R
5390	Grip Plate Escutcheon—Unthreaded	S
5394	Grip Plate Escutcheon—Unthreaded	R
5370	Grip Plate Screw	S
5374	Grip Plate Screw	R
5310	Grip Safety	S
5314	Grip Safety	R
5440	Magazine Complete ·380 Caliber	S
5444	Magazine Complete ·32 Caliber	S

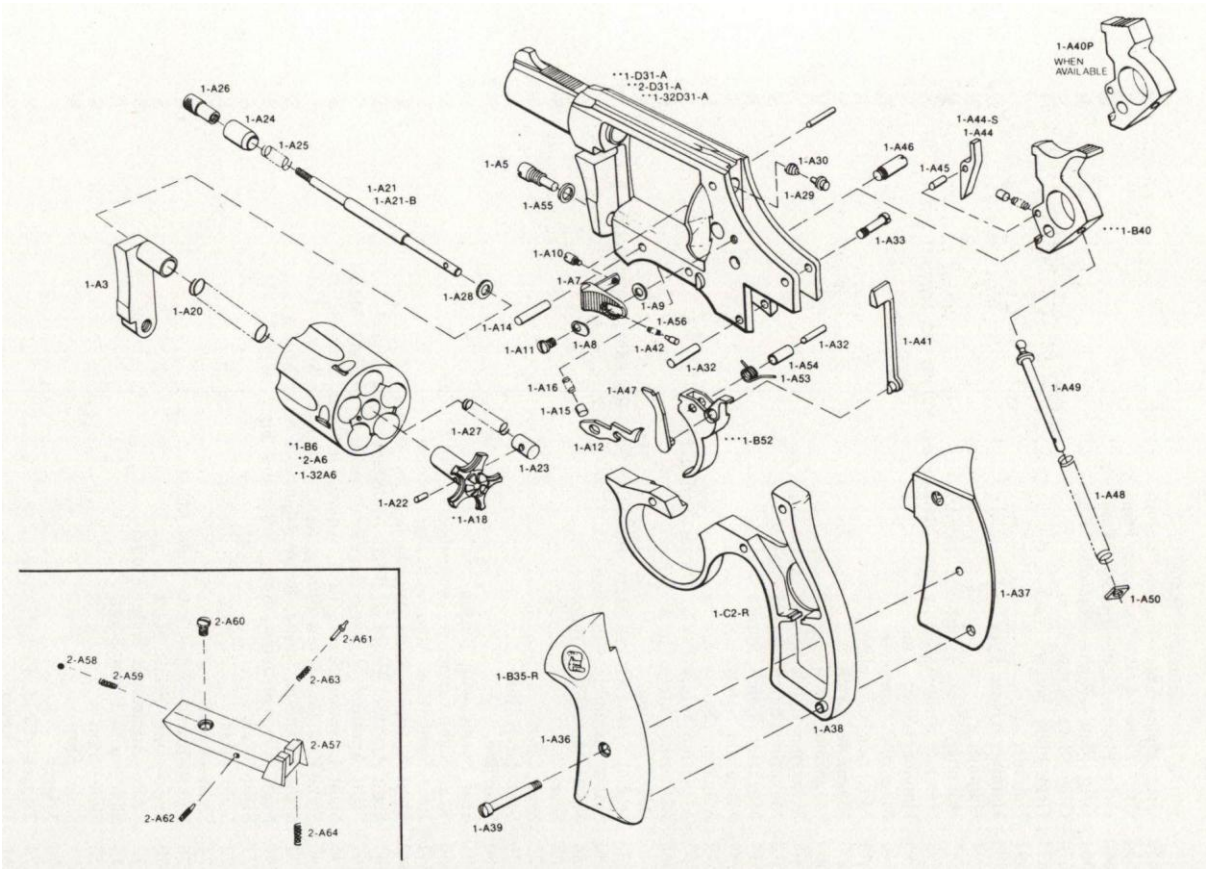
5450	Magazine Complete ·380 Caliber	R
5300	Magazine Latch	S
5304	Magazine Latch	R
5495	Magazine Safety	S-R
5499	Magazine Safety & Extractor Spring	S-R
5326	Recoil Spring	S-R
5480	Safety	S
5484	Safety	R
5493	Safety Spring	S-R
5288	Sear	S-R
5490	Sear Pin, Magazine Safety Pin & Grip Safety Pin	S
5494	Sear Pin, Magazine Safety Pin & Grip Safety Pin	R
5318	Sear Spring	S-R
5210	Slide	S
5214	Slide	R
5330	Slide Ring	S
5334	Slide Ring	R
5270	Trigger	S
5274	Trigger—Gold Plated	R
5280	Trigger Pin	S
5284	Trigger Pin	R



BROWNING 9MM PARABELLUM AUTOMATIC PISTOL
(S—STANDARD; R—RENAISSANCE)

Code No.	Description	Model
5520	Barrel	S-R
5598	Ejector	S
5599	Ejector	R
5615	Extractor	S
5616	Extractor	R
5617	Extractor Pin	S-R
5618	Extractor Spring	S-R
5545	Firing Pin	S-R
5555	Firing Pin Spring	S-R
5558	Firing Pin Retaining Plate	S
5559	Firing Pin Retaining Plate	R
5650	Grip Plate—Left—French Walnut	S
5654	Grip Plate—Left—Nacrolac Pearl	R
5660	Grip Plate—Right—French Walnut	S
5664	Grip Plate—Right—Nacrolac Pearl	R
5670	Grip Plate Screw	S
5674	Grip Plate Screw	R
5592	Hammer	S
5593	Hammer (New Type)	S
5594	Hammer	R
5595	Hammer (New Type)	R
5597	Hammer Strut Assembly with Mainspring, Mainspring Support Pin, & Nut	S-R
5596	Hammer Strut Pin	S-R
5640	Magazine Complete	S
5644	Magazine Complete	R
5600	Magazine Latch	S
5604	Magazine Latch	R
5608	Magazine Latch Spring	S-R
5610	Magazine Latch Spring Guide	S

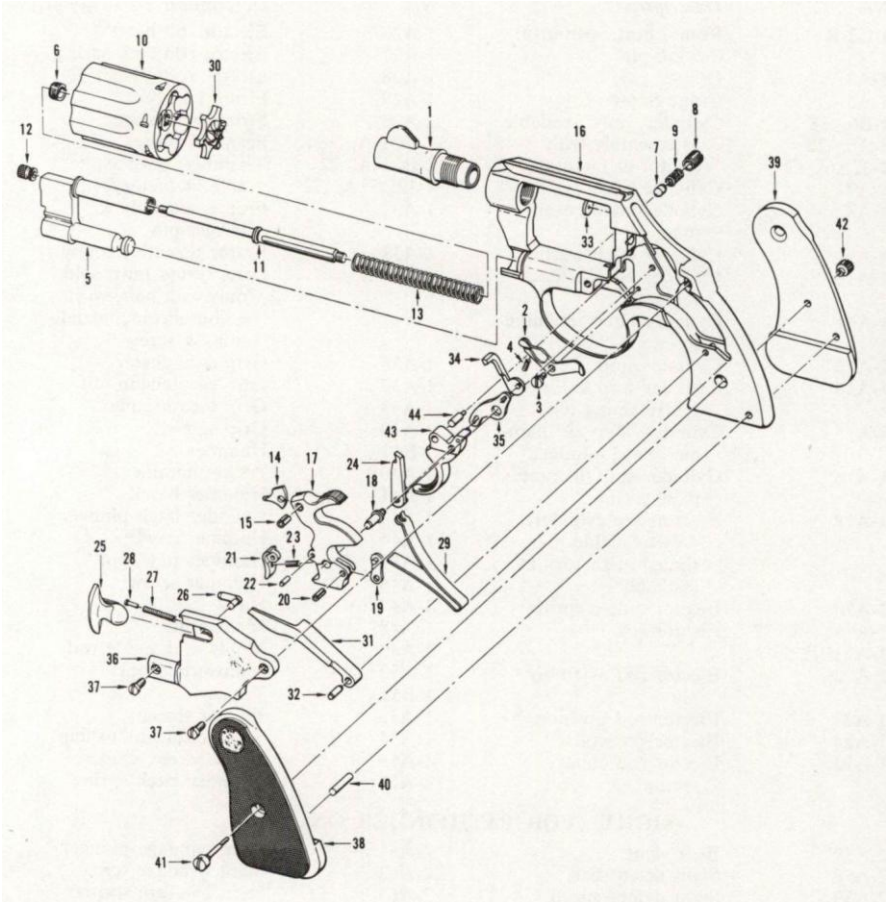
5614	Magazine Latch Spring Guide	R
5695	Magazine Safety	S-R
5699	Magazine Safety Spring	S-R
5567	Magazine Safety Pin & Trigger Spring Pin	S
5568	Magazine Safety Pin & Trigger Spring Pin	R
5540	Recoil Spring	S-R
5538	Recoil Spring Guide Assy, with Slide Stop Retaining Ball, Spring & Cap	S-R
5680	Safety Assembly Complete	S
5684	Safety Assembly Complete	R
5588	Sear	S-R
5625	Sear Lever	S-R
5626	Sear Lever Pin	S-R
5590	Sear Pin	S-R
5591	Sear Spring with Button	S-R
5340	Rear Sight Complete, Adjustable Sight Model	S
5341	Rear Sight Base, Adjustable Sight Model	S
5342	Sight Aperture, Rear, Adjustable Sight Model	s
5343	Sight Aperture Housing, Rear, Adjustable Sight Model	s
5344	Sight Aperture Housing Pin, Rear, Adjustable Sight Model	s
5345	Sight Elevation Screw, Rear, Adjustable Sight Model	s
5346	Sight Elevation Screw Spring, Rear, Adjustable Sight Model	s
5347	Sight Elevation Spring, Rear, Adjustable Sight Model	s
5348	Sight Windage Screw, Rear, Adjustable Sight Model	s
5521	Sight—Rear	s
5522	Sight—Rear	R
5524	Sight—Front	s
5526	Sight—Front—Adjustable Sight Model	s
5510	Slide—with Front Sight	s
5512	Slide—Adjustable Sight Model	s
5514	Slide—with Front Sight	R
5652	Slide Stop	s
5653	Slide Stop	R
5570	Trigger	s
5574	Trigger—Gold Plated	R
5561	Trigger Lever	S-R
5562	Trigger Pin	S
5563	Trigger Pin	R
5575	Trigger Spring	S-R



PARTS LIST—CHARTER ARMS
(UNDERCOVER ·38; PATHFINDER ·22; UNDERCOVERETTE ·32)

Part No.	Description	Part No.	Description
1-C2-R	Round butt, with grip locking pin	1-A26	Ejector rod head
		1-A27	Ejector rod lock spring
1-A3	Crane	1-A28	Ejector rod washer
1-A5	Crane Screw	1-A29	Firing pin
1-B6, ·38	Cylinder; only available	1-A30	Firing pin spring
2-A6, ·22	as assembly with	1-D31-A, ·38	Frame & barrel as-
1-32A6, ·32	ejector at factory	2-D31-A, ·22	sembly; only avail
1-A7	Cylinder latch	1-32D31A, ·32	able at factory
1-A8	Cylinder latch cover plate	1-A32	Frame assembly & trigger pin
1-A9	Cylinder latch washer	1-A33	Frame assembly screw
1-A10	Cylinder latch release screw	1-B35-R	Grip, round butt; sold
			only as a pair, with
1-All	Cylinder latch retaining screw		escutcheons, medal
			lions & screw
1-A12	Cylinder stop	1-A36	Grip escutcheon
1-A14	Cylinder stop & Firing pin retaining pin	1-A37	Grip escutcheon nut
		1-A38	Grip locating pin
1-A15	Cylinder stop & hammer pawl plunger	1-A39	Grip screw
		1-B40	Hammer
1-A16	Cylinder stop, hammer pawl spring	1-A40P	Pocket hammer
		1-A41	Hammer block
1-A18	Ejector; see cylinder; only available installed at factory as assembly	1-A42	Cylinder latch plunger
		1-A44	Hammer pawl
		1-A45	Hammer pawl pin
		1-A46	Hammer screw
1-A20	Ejector return spring	1-A47	Hand
1-A21; ·38, ·32	Ejector rod	1-A48	Mainspring
1-A21B, ·22		1-A49	Mainspring guide rod
1-A22	Ejector rod assembly	1-A50	Mainspring seat
	pin	1-B52	Trigger
1-A23	Ejector rod bushing	1-A53	Trigger spring

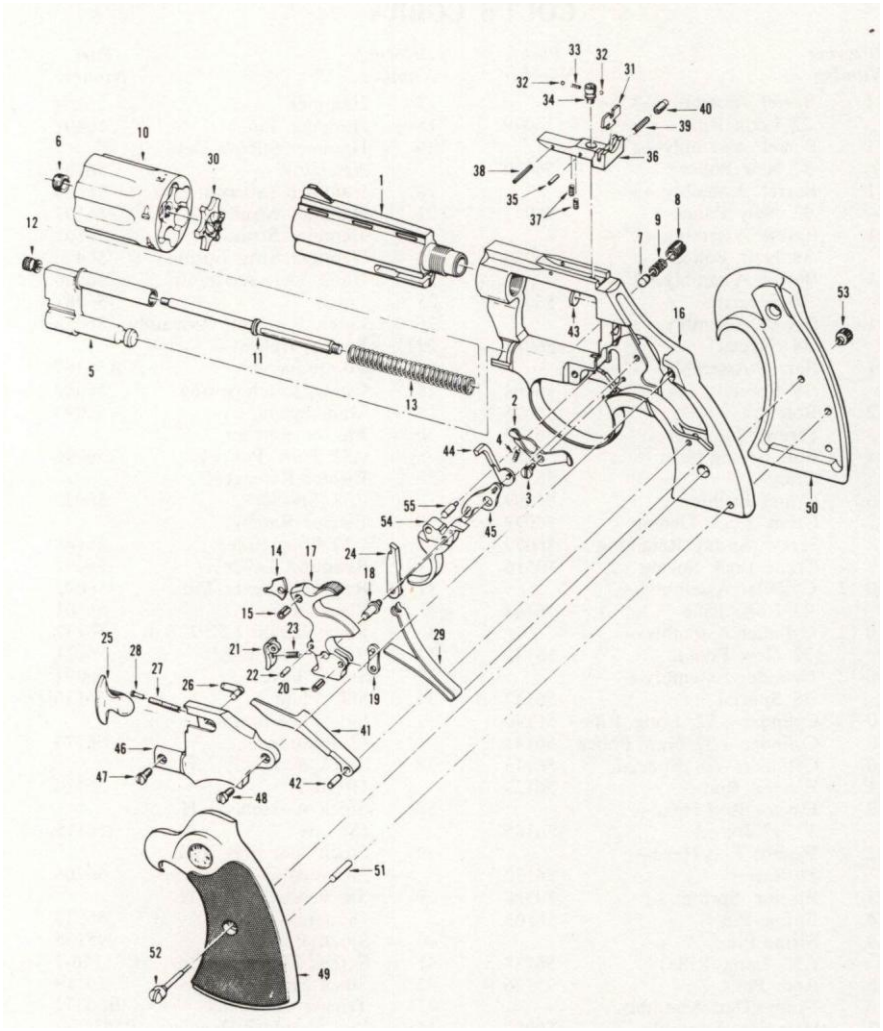
1-A24	Ejector rod collar	1-A54	Trigger spring bushing
1-A25	Ejector rod collar spring	1-A55	Crane screw washer
		1-A56	Cylinder latch spring
SIGHT (FOR PATHFINDER ONLY)			
2-A57	Rear sight	2-A61	Sight windage plunger
2-A58	Sight detent ball	2-A62	Sight windage screw
2-A59	Sight detent spring	2-A63	Sight windage spring
2-A60	Sight elevation screw	2-A64	Sight elevation spring



COLT'S COBRA

Drawing Number		Part Number	Drawing Number		Part Number
1	Barrel Assembly—3″—		17	Hammer	56104
	·22 Long Rifle	56049	18	Hammer Pin	50401
1	Barrel Assembly—2″—		19	Hammer Stirrup Det.	
	·32 New Police	56050		Assembly	56105
1	Barrel Assembly—3″—		20	Hammer (Stirrup Pin)	56108
	·32 New Police	56052	21	Hammer Strut	56107
1	Barrel Assembly—2″—		22	Hammer Strut Pin	56108
	·38 New Police	56056	23	Hammer Strut Spring	50400
1	Barrel Assembly—2″—		24	Hand Det. Assembly	56086
	·38 Special	56059	25	Latch	56087
1	Barrel Assembly—3″—		26	Latch Pin Det. Assembly	56088
	·38 Special	56061	27	Spring, Helical—	
1	Barrel Assembly—4″—			Compression	A56367
	·38 Special	56064	28	Guide, Latch Spring	56089
	Bolt	56076	29	Main Spring	56090
3	Screw, Shoulder	56173	30	Ejector Ratchet	
4	Bolt Spring	50381		(·32 New Police)	56096
5	Crane	56159	30	Ejector Ratchet	
6	Crane Bushing	56099		(·38 Special)	56095
7	Crane Lock Detent	56078	30	Ejector Ratchet	
8	Screw, Spring Retaining	56079		(·22 Long Rifle)	56148
9	Crane Lock Spring	50516	31	Rebound Lever	56091
10-12	Cylinder Assembly—		32	Rebound Lever Pin	56092
	·22 Long Rifle	56144	33	Plate, Recoil	56101
10-12	Cylinder Assembly—		33	Plate, Recoil (·22 L. R.)	56137
	·32 New Police	56145	34	Safety Assembly	56171
10-12	Cylinder Assembly—		35	Safety Lever	56094
	·38 Special	56147	36	Side Plate	56136
10	Cylinder— ·22 Long Rifle	56140	37	Side Plate Screw	
10	Cylinder— ·32 New Police	56141		(2 Required)	56176
10	Cylinder— ·38 Special	56143	38	Stock Assembly L. H.	
11	Ejector Rod	56129		(Round)	56124

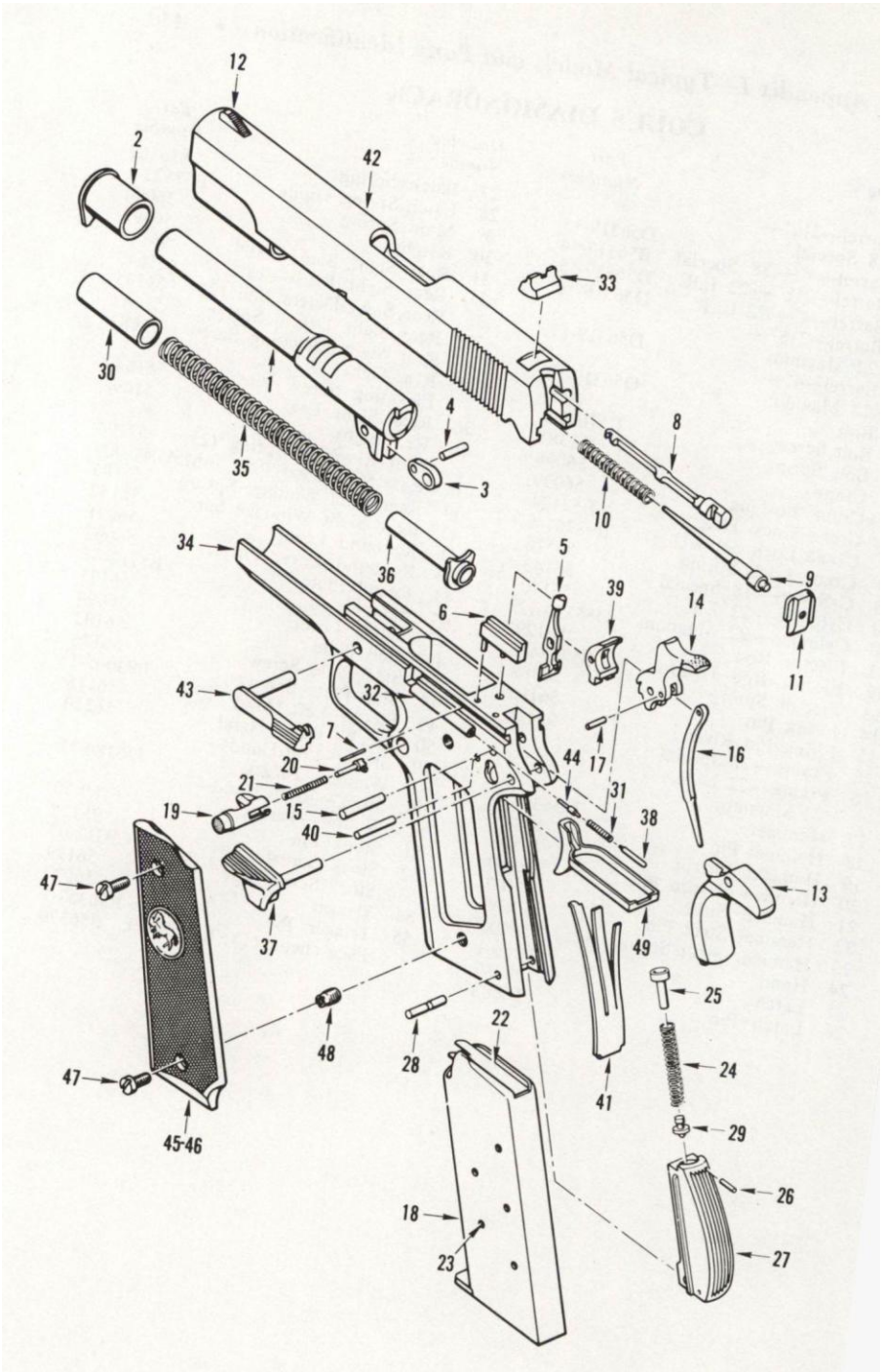
12	Ejector Rod Head—-		38	Stock Assembly L. H.	
	3″, 4″ Barrel	56165		(Square)	56115
12	Ejector Rod Head—		39	Stock Assembly R. H.	
	2″ Barrel	56132		(Round)	56206
13	Ejector Spring	50388	39	Stock Assembly R. H.	
14	Firing Pin	56103		(Square)	56210
14	Firing Pin		40	Stock Pin	95135
	(·22 Long Rifle)	56138	41	Screw, Fillister Head	C93116-3
15	Roll Pin	95136	42	Stock Screw Nut	56119
16	Frame Det. Assembly		43	Trigger Assembly	B56372
17	Hammer Assembly	56082	44	Pin, Shoulder Headless	B56357-1



COLT’S DIAMONDBACK

Drawing Number		Part Number	Drawing Number		Part Number
1	Barrel—2½″—		27	Latch Spring	A56367
	·38 Special	D56319-13	28	Latch Spring Guide	B57123-1
1	Barrel—4″— ·38 Special	B56319-14	29	Main Spring	56090
1	Barrel—2½"— ·22 L. R.	D56319-15	30	Ratchet	56095
1	Barrel—4"— ·22 L. R.	D56319-16	31	Rear Sight Blade—. 100	56148
1	Barrel—2½″—		31	Rear Sight Blade—Vs″	51648
	·22 Magnum	D56319-17	32	Rear Sight Detent Ball (2)	51195
1	Barrel—4″—		33	Rear Sight Detent Spring	51683
	·22 Magnum	D56319-18	34	Rear Sight Elevating Screw	51682
2	Bolt	56076	35	Rear Sight	
3	Bolt Screw	B57077-1		Elevating Screw Pin	51649
4	Bolt Spring	50381	36	Rear Sight Leaf	51692
5	Crane	56098	36	Rear Sight	
6	Crane Bushing	56099		Leaf Elevating Spring (2)	51194
7	Crane Lock Detent	B57124	38	Rear Sight Leaf Pin MS9047-008	
8	Crane Lock Screw	B93701-1	39	Rear Sight Windage Spring	51193
9	Crane Lock Spring	50516	40	Rear Sight Windage Screw	51192
10	Cylinder— ·38 Special	56143	41	Rebound Lever	56091
10	Cylinder— ·22 L. R.	56140	42	Rebound Lever Pin	56092
10	Cylinder— ·22 Magnum	D56320-12	43	Recoil Plate	B57120-1
11	Ejector Rod	56129	44	Safety	56171
12	Ejector Rod Head	B57134-1	45	Safety Lever	56094
13	Ejector Spring	50388	46	Side Plate	56102
14	Firing Pin	56103	47	Side Plate Screw	56176
15	Firing Pin Rivet	95136	48	Side Plate Screw	B93005-1
16	Frame— ·38 Special		49	Stock—Left Hand	56115
16	Frame— ·22 L. R. —		50	Stock—Right Hand	56210
	·22 Magnum		49	Stock—Left Hand—	

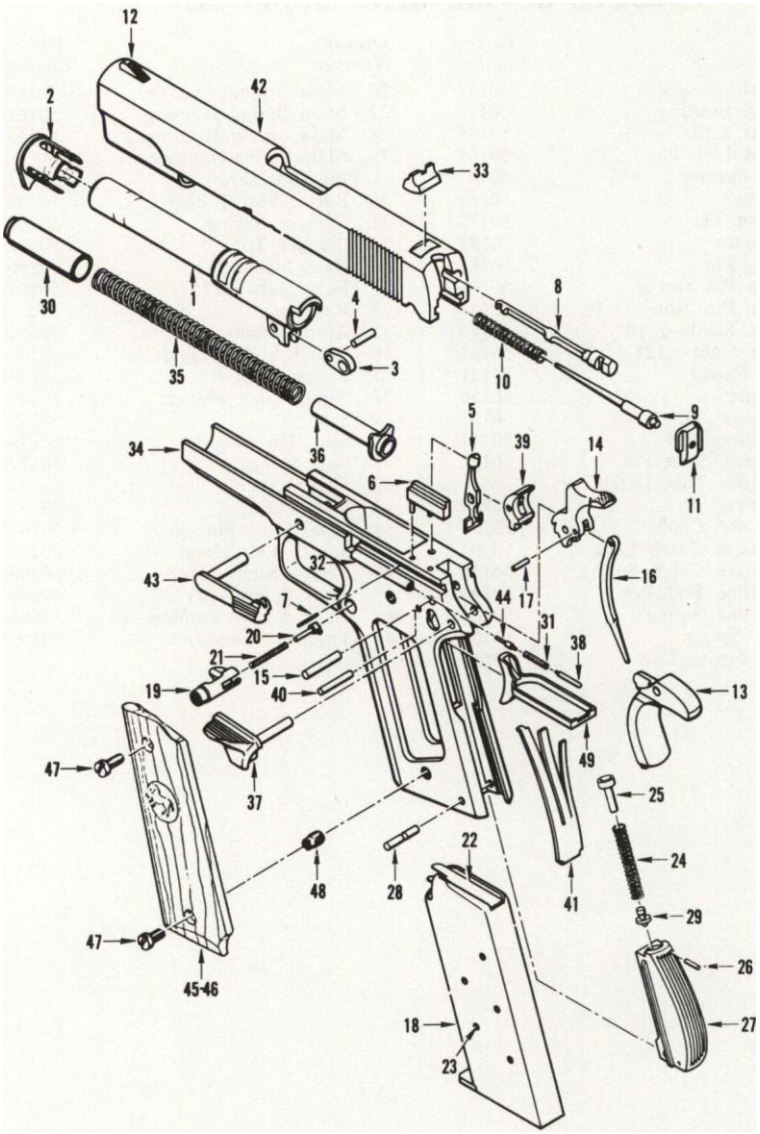
17	Hammer	D56326-3		Walnut—Target	156180-11
18	Hammer Pin	50401	50	Stock—Right Hand—	
19	Hammer Stirrup	56106		Walnut—Target	156180-10
20	Hammer Stirrup Pin	95009	51	Stock Pin	95135
21	Hammer Strut	56107	52	Stock Screw	C93116-3
22	Hammer Strut Pin	56108	53	Stock Screw Nut	56119
23	Hammer Strut Spring	50400	54	Trigger	56097
24	Hand	56086-1	55	Trigger Pin	B56357-1
25	Latch	56087		Escutcheon (1), Left Stock	B56370
26	Latch Pin	56088			



COLT'S GOVERNMENT MODEL ·45

Drawing Number		Part Number	Drawing Number		Part Number
1	Barrel	50142	26	Main Spring Cap Pin	50160
2	Barrel Bushing	50145	27	Main Spring Housing	50161
3	Barrel Link	50143	28	Main Spring Housing Pin	50163
4	Barrel Link Pin	50144	29	Main Spring Housing	
5	Disconnector	50147		Pin Retainer	50162
6	Ejector	50169	30	Recoil Spring Plug	50206
7	Ejector Pin	50170	31	Plunger Spring	50165
8	Extractor	50184	32	Plunger Tube	50171
9	Firing Pin	50185	33	Rear Sight—1/10″	50190
10	Firing Pin Spring	50186	33	Rear Sight— ·125	50194
11	Firing Pin Stop	52434	34	Receiver	
12	Front Sight—1/10″	50189	35	Recoil Spring	50204
12	Front Sight— ·125	50193	36	Recoil Spring Guide	50205
13	Grip Safety	53821	37	Safety Lock	50174
14	Hammer	50150	38	Safety Lock Plunger	50166
15	Hammer Pin	50153	39	Sear	50177

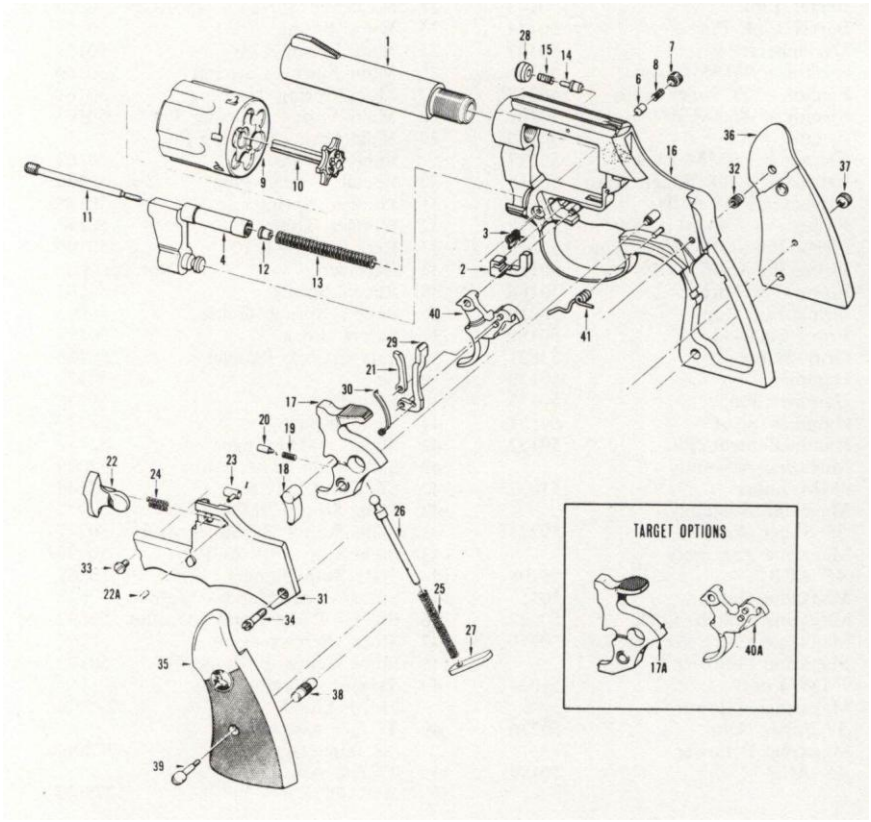
16	Hammer Strut	50151	40	Sear Pin	50178
17	Hammer Strut Pin	50152	41	Sear Spring	50179
18	Magazine Tube Detail Assembly	50201	42	Slide	50191
			43	Slide Stop	50195
19	Magazine Catch	50155	44	Slide Stop Plunger	50167
20	Magazine Catch Lock	50007	45	Stock—Left Hand	50207
21	Magazine Catch Spring	50156	46	Stock—Right Hand	50208
22	Magazine Follower	50199	47	Stock Screw—(4)	50209
23	Magazine Spring	50200	48	Stock Screw Bushing—(4)	53665
24	Main Spring	50158	49	Trigger Assembly	50180
25	Main Spring Cap	50159			



COLT'S MK IV/ SERIES '70 GOVERNMENT MODEL

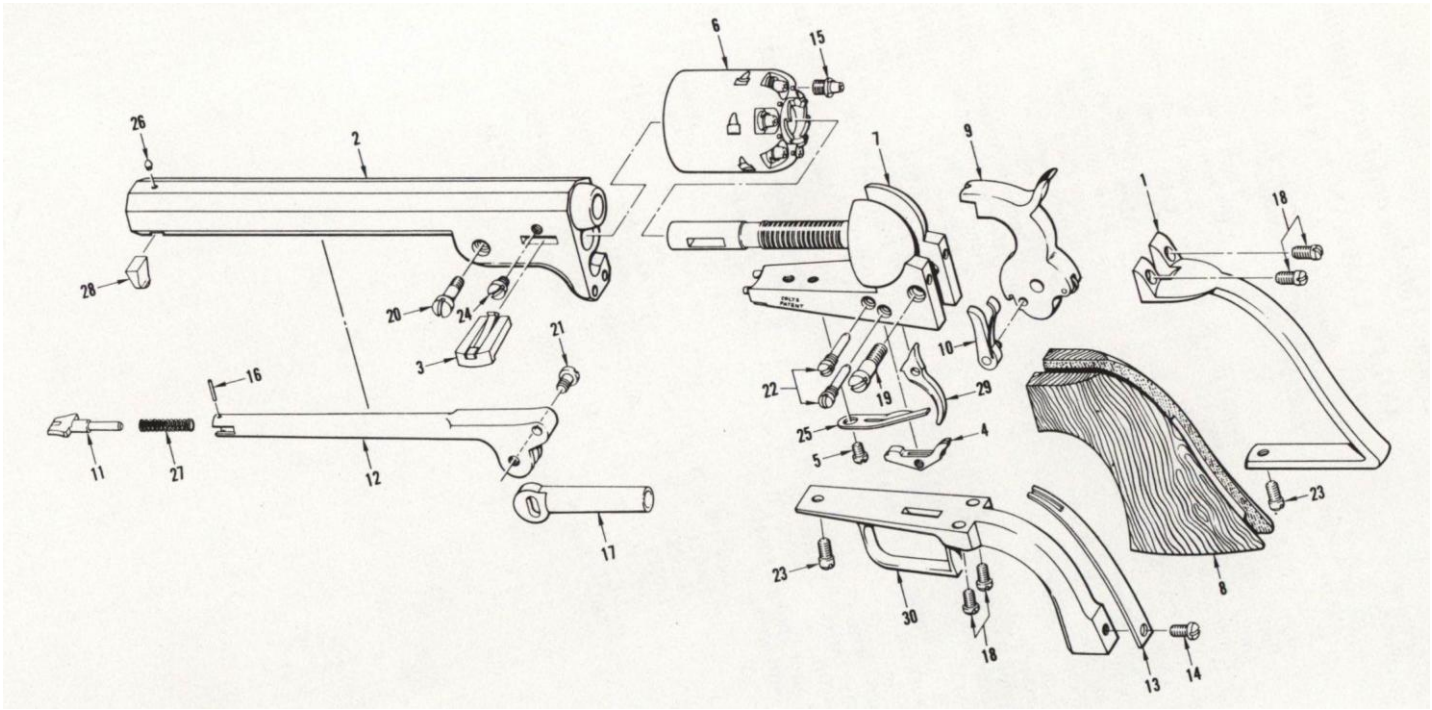
Drawing Number		Part Number	Drawing Number j		Part dumber
1	Barrel - 9MM Luger	52717	23	Magazine Spring -	
1	Barrel - ·38 Super Auto	52719		9MM Luger	51035
1	Barrel - ·45 ACP	52279	23	Magazine Spring -	
2	Barrel Bushing	52207		·38 Super Auto	51038
3	Barrel Link	50143	23	Magazine Spring - ·45 ACP	50200
4	Barrel Link Pin	50144	24	Main Spring	50158
5	Disconnector	50147	25	Main Spring Cap	50159
6	Ejector - 9MM Luger	50144	26	Main Spring Cap Pin	50160
6	Ejector - ·38 Super Auto	50215	27	Main Spring Housing	50161
6	Ejector - ·45 ACP	50169	28	Main Spring Housing Pin	50163
7	Ejector Pin	50170	29	Main Spring Housing Pin	
8	Extractor - 9MM Luger	50217		Retainer	50162
8	Extractor - ·38 Super Auto	50217	30	Recoil Spring Plug	50206
8	Extractor - ·45 ACP	50184	31	Plunger Spring	50165
9	Firing Pin - 9MM Luger	50218	32	Plunger Tube	50171
9	Firing Pin - ·38 Super Auto	50218	33	Rear Sight—1/10″	50190
9	Firing Pin - ·45 ACP	50185	34	Receiver Not 1	'or sale
10	Firing Pin Spring	50186	35	Recoil Spring	50204
11	Firing Pin Stop	50219	36	Recoil Spring Guide	50205
12	Front Sight—1/10″	50189	37	Safety Lock	50174
13	Grip Safety	53821	38	Safety Lock Plunger	50166
14	Hammer	50150	39	Sear	50177
15	Hammer Pin	50153	40	Sear Pin	50178
16	Hammer Strut	50151	41	Sear Spring	50179

17	Hammer Strut Pin	50152	42	Slide - 9MM Luger	52742
18	Magazine Assembly -		42	Slide - ·38 Super Auto	52739
	9MM Luger	51032	42	Slide - ·45 ACP	52648
18	Magazine Assembly -		43	Slide Stop - 9MM Luger	50277
	·38 Super Auto	50225	43	Slide Stop - ·38 Super Auto	50277
18	Magazine Assembly -		43	Slide Stop - ·45 ACP	50195
	·45 ACP	50198	44	Slide Stop Plunger	50167
19	Magazine Catch	50155	45	Stock - Left Hand - Walnut	52633
20	Magazine Catch Lock	50007	46	Stock - Right Hand - Walnut	52632
21	Magazine Catch Spring	50156	47	Stock Screws—(4)	50209
22	Magazine Follower -		48	Stock Screw Bushing (4)	50173
	9MM Luger	51034	49	Trigger Assembly -	
22	Magazine Follower -			9MM Luger	52750N
	·38 Super Auto	50226	49	Trigger Assembly -	
22	Magazine Follower -			·38 Super Auto	52750N
	·45 ACP	50199	49	Trigger Assembly - ·45 ACP	52750N



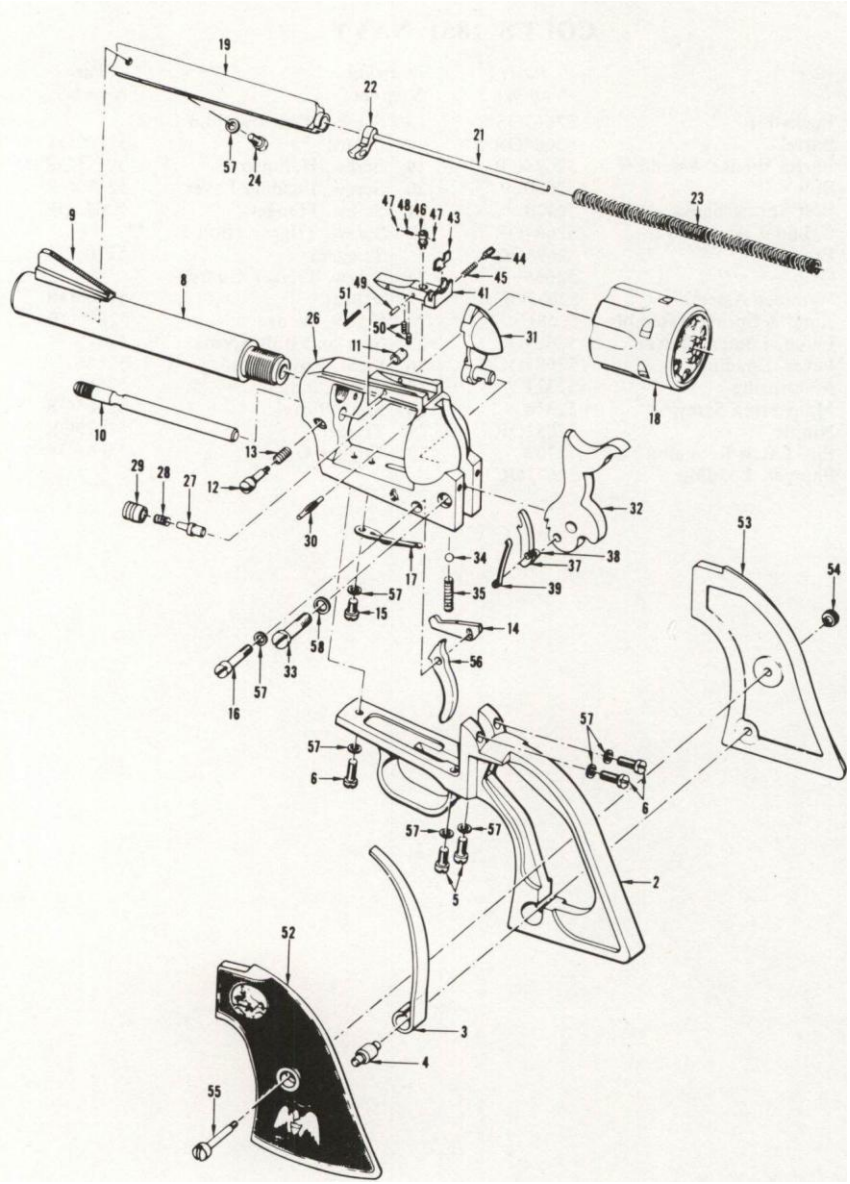
COLT'S LAWMAN MK III

Drawing Number		Part Number	Drawing Number		Part Number
1	Barrel Assembly—4″—Heavy— ·357 Magnum	580202 B or N	22a	Latch Insert	580921 B
			22b	Latch Insert	580922 N
			23	Latch Pin Assembly	580771 B
2	Bolt	580691 B or N	24	Latch Spring	580551
3	Bolt Spring	580511	25	Main Spring	580561
4	Crane Assembly	580311	26	Main Spring Guide	580241
6	Crane Lock Detent	580041B	27	Main Spring Seat	580261 B or N
7	Crane Lock Screw	580031 B or N	28	Recoil Plate	580461
8	Crane Lock Spring	580051	29	Safety Connector	580711 B
9	Cylinder Assembly — ·357 Magnum—with Ejector Ratchet and Stem	580733 B or N	29 and 30	Safety Connector Assembly	580531 B
			30	Safety Connector and Hand Spring	580521
10	Ejector Ratchet and Stem	—	31	Side Plate	580401
			32	Side Plate Nut	580481 B or N
11	Ejector Rod	580761 B or N	33	Side Plate Screw	580351 B or N
12	Ejector Rod Bushing	580271 B or N	34	Side Plate and Stock Screw	580341 B or N
13	Ejector Rod Spring	580571			
14	Firing Pin	580451	35-	-37 Stock Assembly —Service	580022
15	Firing Pin Spring	580541			
16	Frame Detail Assembly	—	35	Stock—Service—Left Hand	580602
17	Hammer—Service	580102 B or N	36	Stock—Service—Right Hand	580601
17a	Hammer—Target	580101B			
18	Hammer Strut	580701 B or N	37	Stock Nut	50089 B
19	Hammer Strut Spring	580541	38	Stock Pin	580441
20	Hammer Strut Spring Guide	580431 B or N	39	Stock Screw	50088 B
			40	Trigger Assembly—Service—Serrated	580592 B or N
21	Hand	580321			
21	Hand (Alt.)	580322	40a	Trigger Assembly—Service—Smooth	580593 B
21	Hand (Alt.)	580323			
21	Hand (Alt.)	580324	41	Trigger Return Spring	580581
21	Hand (Alt.)	580325			
22	Latch	580751 B or N			



COLT'S 1851 NAVY

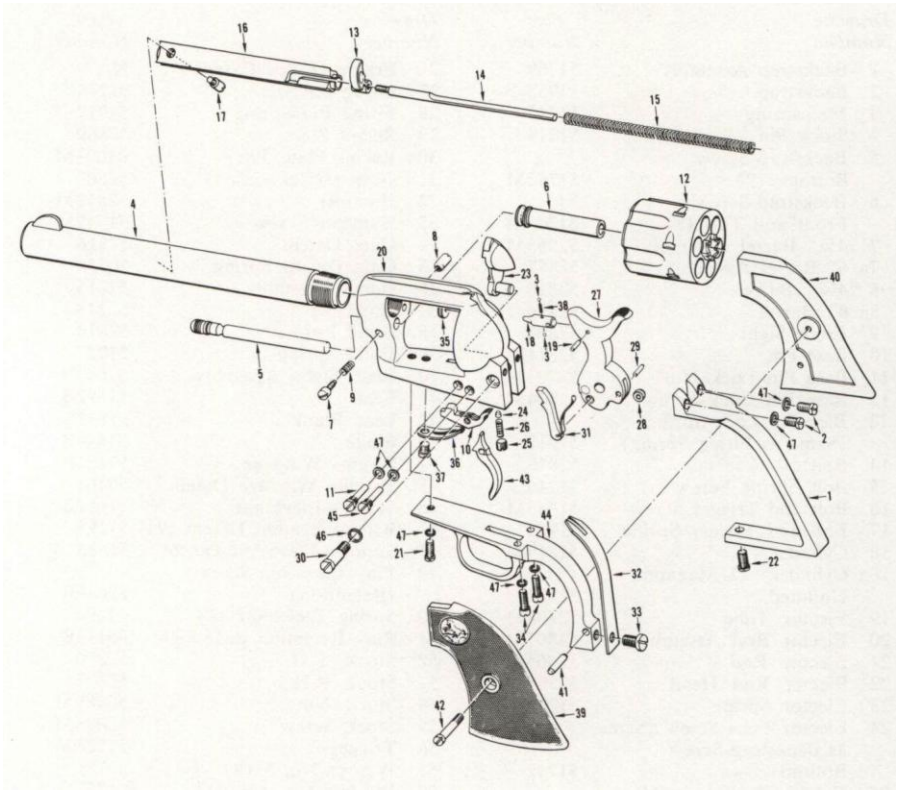
Drawing Number		Part Number	Drawing Number		Part Number
1	Backstrap	526670S	18	Screw, Backstrap and Guard	527070R
2	Barrel	526840R	19	Screw, Hammer	526780R
3	Barrel Wedge Assembly	526740R	20	Screw, Loading Lever	5267 30R
4	Bolt	52680	21	Screw, Plunger	526720R
5	Bolt Spring Screw	52320	22	Screw, Trigger (Bolt & Trigger)	527050R
6	Cylinder Assembly	526640R	23	Screw, Trigger Guard & Butt	526660R
7	Frame	526760C	24	Screw, Wedge	526750R
8	Grip	52668	25	Sear and Bolt Spring	52319
9	Hammer Assembly	526770C	26	Sight, Front	52686
10	Hand & Spring Assembly	52681	27	Spring, Latch	52688
11	Latch, Loading Lever	526890C	28	Stud, Barrel	526850R
12	Lever, Loading	526870C	29	Trigger	526790R
13	Mainspring	52321	30	Trigger Guard	526650S
14	Mainspring Screw	52318			
15	Nipple	526830R			
16	Pin, Latch Retaining	52702			
17	Plunger, Loading	5267 IOC			



COLT'S NEW FRONTIER ·22

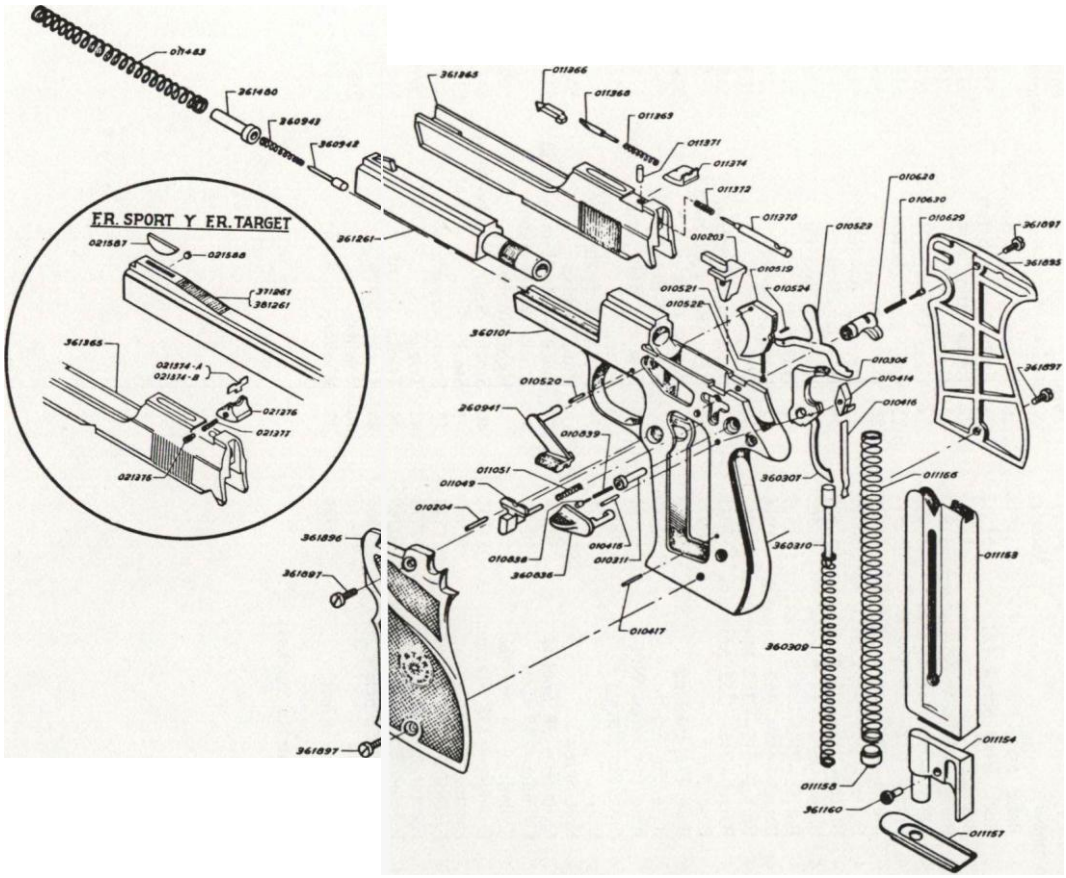
Drawing Number		Part Number	Drawing Number		Part Number
1	Backstrap Assembly	51769	26	Frame (Color Cased)	NA
2	Backstrap	51758	27	Firing Pin	51774
3	Mainspring	51718	28	Firing Pin Spring	51717
4	Stock Pin	51719	29	Recoil Plate	52809
5	Backstrap Screw, Bottom (2)	51742M	30	Recoil Plate Pin	95003M
			31	Gate (Color Cased)	52802
6	Backstrap Screw, Front and Top (3)	51743M	32	Hammer	52812M
			33	Hammer Screw	51747M
7	4¾″ Barrel Assembly	52855M	34	Gate Detent	52816
7a	6″ Barrel Assembly	52857	35	Gate Detent Spring	50156
8	4¾″ Barrel	52818	36	Hand Assembly	52815
8a	6″ Barrel	52856	37	Hand	52813
9	Front Sight	52853	38	Hand Post	52814
10	Base Pin	52811M	39	Hand Spring	51727
11	Base Pin Lock Nut	52803M	40	Rear Sight Assembly	51693B
12	Base Pin Lock Screw	52804M	41	Leaf	51692B
13	Base Pin Lock Spring (Same as Firing Spring)	51717	42	Leaf Blank	51831
			43	Blade	51648B
14	Bolt	52810	44	Screw—Windage	51192B
15	Bolt Spring Screw	51746	45	Spring—Windage Detent	50461
16	Bolt and Trigger Screw	51745M	46	Screw—Elevation	51682B
17	Bolt and Trigger Spring	51750	47	Ball—Elevation Detent (2)	51195
18	Cylinder	52817M	48	Spring—Elevation Detent	51683
18a	Cylinder, ·22 Magnum		49	Pin—Elevation Screw	

	Unfluted	52823		(Retention)	51649B
19	Ejector Tube	52808M	50	Spring Elevation (2)	51194
20	Ejector Rod Assembly	52807M	51	Pin—Retention Rear Sight	95112B
21	Ejector Rod	52805M	52	Stock, L. H.	52876
22	Ejector Rod Head	52806M	53	Stock, R. H.	52877
23	Ejector Spring	51722	54	Stock Nut	50089M
24	Ejector Tube Screw (Same		55	Stock Screw	50088M
	as Backstrap Screw		56	Trigger	51728M
	Bottom)	51742	57	Washer No. 5 (8)	51751
25	Frame Detail Assembly		58	Washer No. 10 (2)	51752
	(No. Dwg.)	NA			



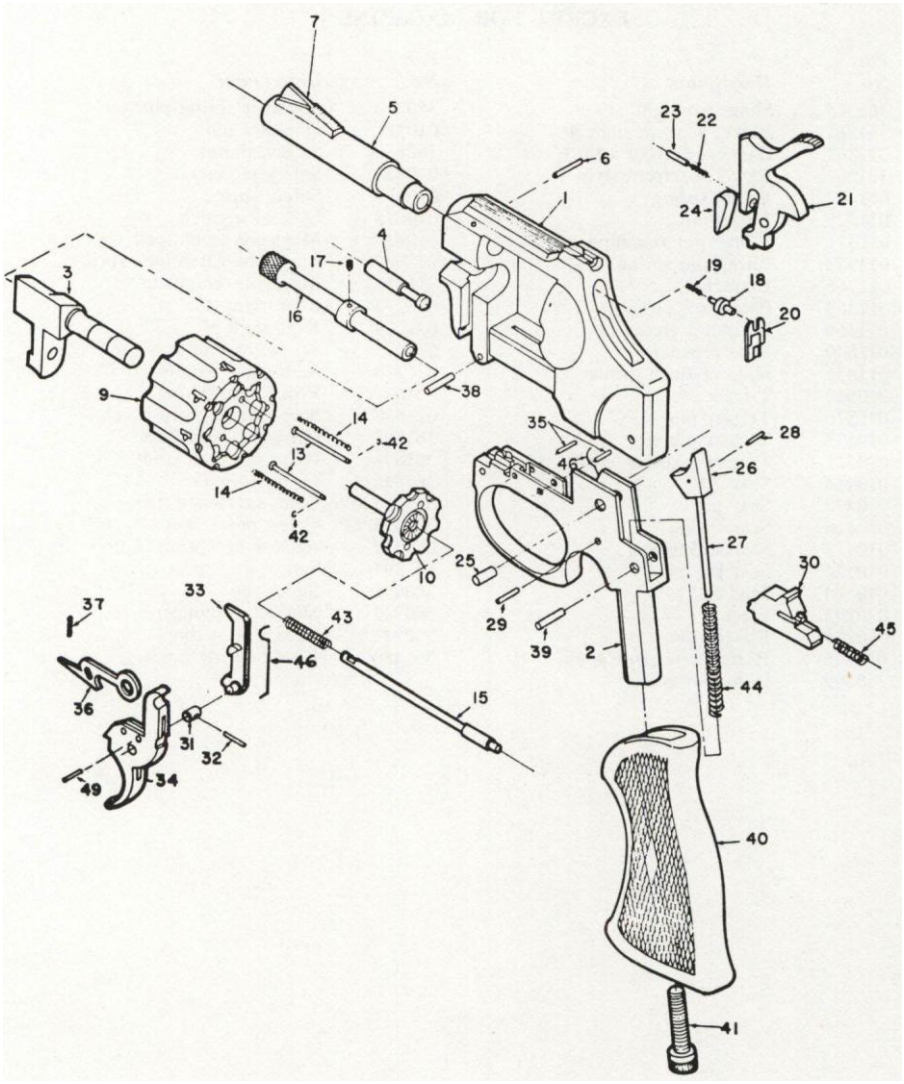
COLT'S SINGLE ACTION ARMY

Drawing Number		Part Number	Drawing Number		Part Number
1	Back Strap	51516	20	Frame—(Wood Stocks)	
2	Back Strap Screw (2)	51572	21	Front Guard Screw	51565
3	Ball (2)	51195	22	Front Strap Screw	51565
4	Barrel—4¾— ·38 Special	51823	23	Gate	51513
4	Barrel—5½— ·38 Special	50995	24	Gate Catch	50967
4	Barrel—7½— ·38 Special	51511	25	Gate Catch Screw	51571
4	Barrel—4¾— ·45 Colt	51820	26	Gate Spring	50966
4	Barrel—5½— ·45 Colt	50992	27	Hammer Assembly	51919
4	Barrel—7½— ·45 Colt	51509	28	Hammer Roll	50959
4	Barrel—5½— ·44 Special	51505	29	Hammer Roll Pin	50960
4	Barrel—7½— ·44 Special	51507	30	Hammer Screw	51574
4	Barrel—4¾— ·357 Magnum	51916	31	Hand Assembly	51000
4	Barrel—5½— ·357 Magnum	51917	32	Main Spring	50982
4	Barrel—7½— ·357 Magnum	51918	33	Main Spring Screw	51567
5	Base Pin	50977	34	Rear Guard Screw (2)	51566
6	Base Pin Bushing	50978	35	Recoil Plate	51912
7	Base Pin Screw	50980	36	Sear and Bolt Spring	50974
8	Base Pin Screw Nut	50981	37	Sear and Bolt Spring Screw	51569
9	Base Pin Spring	50979	38	Spring	51683
10	Bolt	50976	39	Stock—Left Hand—	
11	Bolt Screw	51570		Hard Rubber	50988
12	Cylinder— ·38 Special	50998	39	Stock—Left Hand—Wood	51832
12	Cylinder— ·45 Colt	50997	40	Stock—Right Hand—	
12	Cylinder— ·44 Special	51504		Hard Rubber	50986
12	Cylinder— ·357 Magnum	51531	40	Stock—Right Hand—Wood	51834
13	Ejector Head	51586	41	Stock Pin	51517
14	Ejector Rod	51573	42	Stock Screw	51576
15	Ejector Spring	50973	43	Trigger	50962
16	Ejector Tube	50969	44	Trigger Guard	51514
17	Ejector Tube Screw	51568	45	Trigger Screw	51570
18	Firing Pin	51914	46	Washer	51850
19	Firing Pin Rivet	50991	47	Washer No. 8 (7)	51849
20	Frame— (Hard Rubber Stocks)				



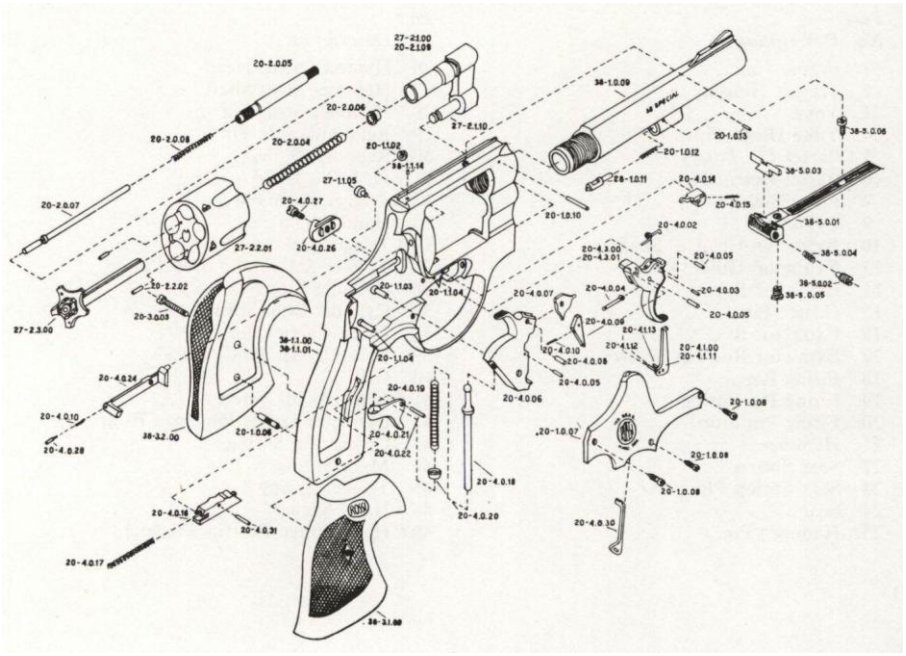
FIREARMS INTERNATIONAL MODEL “FR” (PARTS ARE SAME FOR OLYMPIC AS MOD. F 6″, EXCEPT FOR MAGAZINE.)

Part No.	Description	Part No.	Description
361365	Slide wo/sight	360310	Hammer spring plunger
361261	Barrel w/front sight 4½″	010311	Hammer pin
371261	Barrel wo/front sight 6″	360836	Safety, thumb
381261	Barrel wo/front sight 7″	010838	Safety plunger
011483	Recoil spring	010839	Safety spring
011370	Firing pin	010628	Magazine catch
011371	Firing pin retaining pin	010629	Magazine catch lock
011372	Firing pin spring	010630	Magazine catch lock spring
011366	Extractor	01115/7	Magazine complete
011368	Extractor plunger	013374	Rear sight 4¼″
011369	Extractor spring	021374	Rear sight 6″ or 7″
011049	Slide retainer	021375	Screw, rear sight 6″ or 7″
011051	Slide retainer spring	021376	Rear sight base 6″ or 7″
010519	Trigger	021587	Front sight 6″ or 7″
010520	Trigger pin	021588	Screw, front sight 6″ or 7″
010522	Trigger plunger	361895	Grip, std. right hand
010521	Trigger plunger spring	361896	Grip, std. left hand
010414	Sear	361895/6	Grip, std. pair
010415	Sear pin	361895/6W	Grip, std. wood, pair
010416	Sear spring	361895/6P	Grips, pearl, pair
010417	Sear spring pin	011377	Rear sight, spring 6″ or 7″
010524	Sear bar pin	361897	Screw, grip, pair
010523	Sear bar	360941	Slide stop
010203	Ejector	360942	Slide stop plunger
010204	Ejector pin	360943	Slide stop spring
010306	Hammer w/strut & pin	361480	Recoil spring guide
360309	Hammer spring		



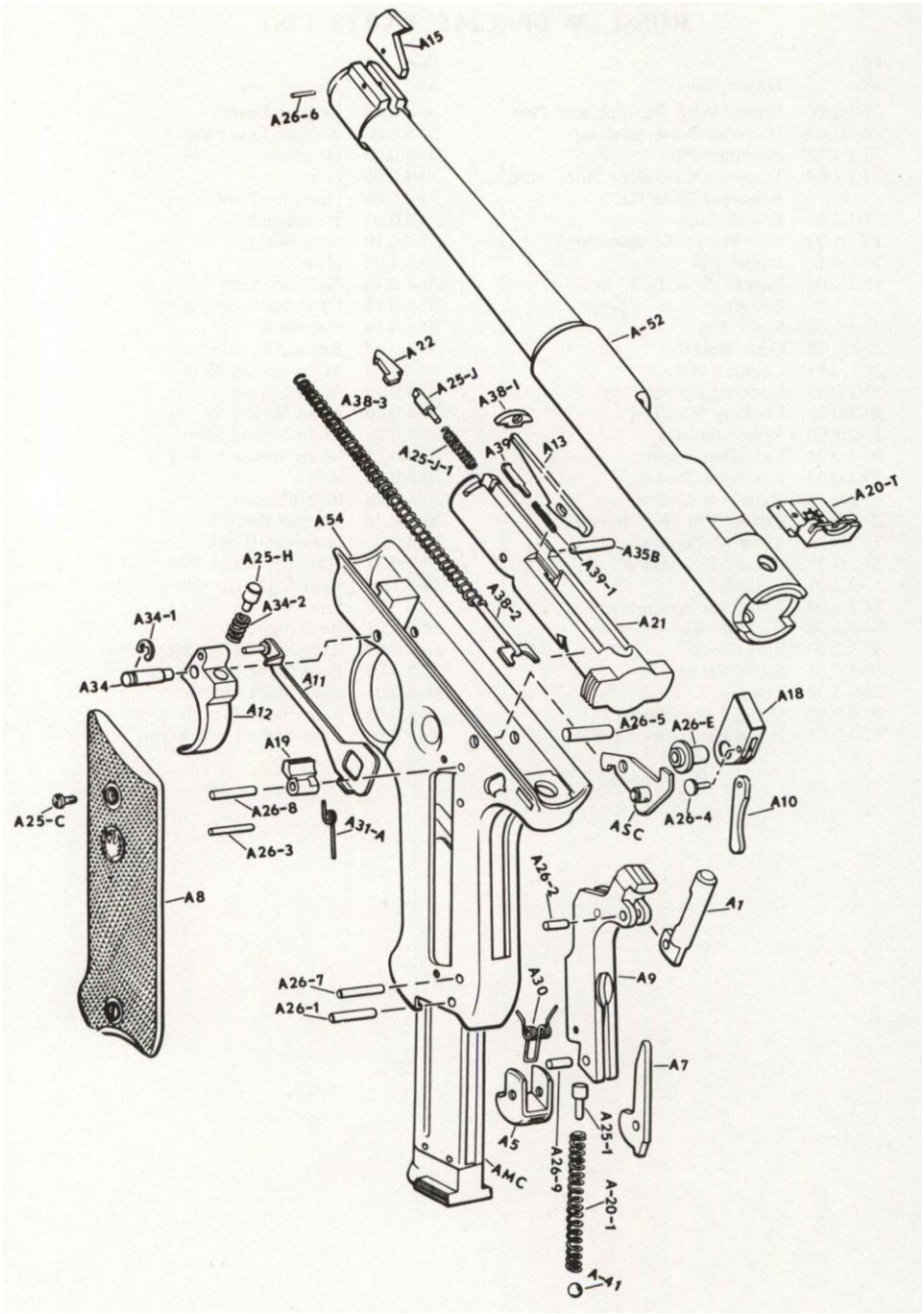
FIC REGENT REVOLVER PARTS LIST

Part No.	Description	Part No.	Description
1	Frame	26	Hammer Strut Head
2	Trigger Housing	27	Hammer Strut Shaft
3	Yoke	28	Hammer Strut Pin
4	Yoke Hinge Pin	29	Rebound Slide Pin
5	Barrel (3″ 4″ 6″)	30	Rebound Slide
6	Barrel Detent Pin	31	Push Pin Head
7	Front Sight	32	Trigger Push Pin
9	Cylinder	33	Hand
10	Extractor Head & Shaft	34	Trigger
13	Extractor Guide Pin	35	Trigger & Cylinder Stop Pin
14	Extractor Spring	36	Cylinder Stop
15	Center Pin	37	Cylinder Stop Spring
16	Extractor Rod	38	Front Carrier Pin
17	Extractor Rod Set Screw	39	Rear Carrier Pin
18	Firing Pin	40	Grip
19	Firing Pin Spring	41	Grip Holder Screw
20	Firing Pin Stop	42	Extractor Guide Pin Snap Ring
21	Hammer	43	Center Pin Spring
22	Sear Spring	44	Main Spring
23	Sear Spring Plunger	45	Trigger Spring
24	Sear	46	Hand Spring
25	Hammer Pin	49	Hand Hinge Pin (in Trigger)



ROSSI ·38 SPECIAL PARTS LIST

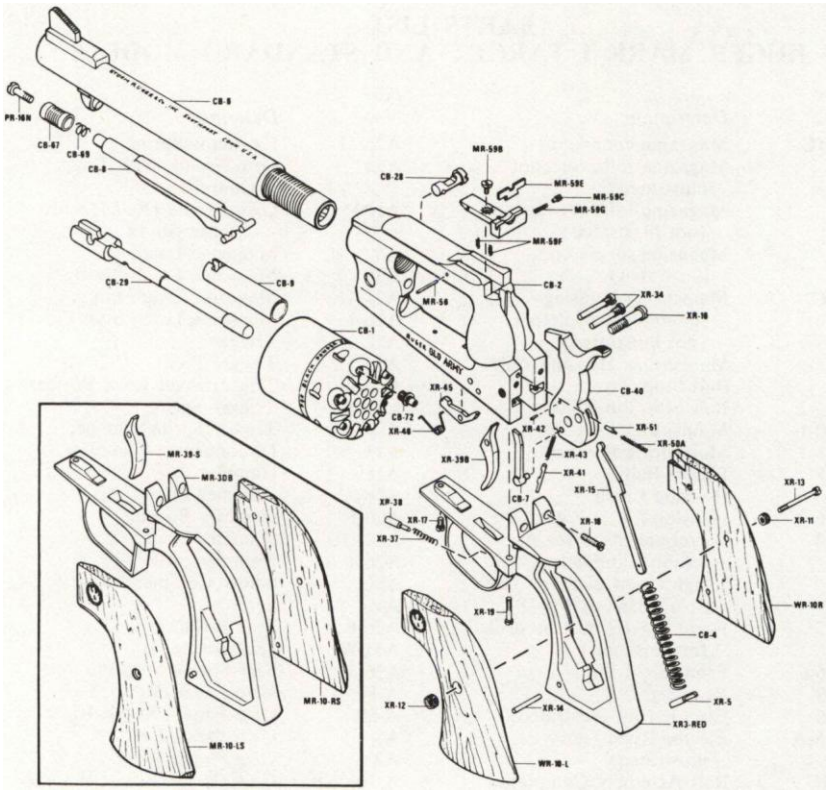
Part No.	Description	Part No.	Description
38-1. 1. 00	Frame With Bushing and Pins	20-4. 0. 04	Trigger Lever
20-1. 1. 02	Hammer Nose Bushing	20-4. 0. 05	Trigger Lever Pin
20-1. 1. 03	Hammer Pin	20-4. 0. 06	Hammer
20-1. 1. 04	Trigger, Cylinder Stop, and Rebound Slide Pin	20-4. 0. 09	Sear
		20-4. 0. 08	Hammer Nose Rivet
27-1. 1. 05	Frame Lug	20-4. 0. 07	Hammer Nose
20-1. 1. 07	Side Plate (To assembly)	20-4. 0. 10	Sear Spring
20-1. 0. 10	Barrel Pin	20-4. 1. 00	Hand
38-1. 0. 09	Barrel (Specify 4″ or 6″ Length)	20-4. 0. 14	Cylinder Stop
		20-4. 0. 15	Cylinder Stop Spring
20-1. 0. 06	Stock Pin	20-4. 0. 16	Rebound Slide
20-1. 0. 08	Plate Screw	20-4. 0. 17	Rebound Slide Spring
28-1. 0. 11	Locking Bolt	20-4. 0. 18	Main Spring Rod
20-1. 0. 12	Locking Bolt Spring	20-4. 0. 19	Main Spring
20-1. 0. 13	Locking Bolt Pin	20-4. 0. 20	Main Spring Swivel
27-2. 1. 00	Yoke (Crane)	20-4. 0. 21	Main Spring Stop
20-2. 0. 04	Extractor Spring	20-4. 0. 22	Main Spring Stop Pin
20-2. 0. 05	Extractor Rod	20-4. 0. 24	Bolt
20-2. 0. 06	Extractor Collar	20-4. 0. 28	Bolt Plunger
20-2. 0. 07	Center Pin (For Barrel 4″ or 6″ Length)	20-4. 0. 26	Thumb Piece
		20-4. 0. 30	Hammer Block
20-2. 0. 08	Center Pin Spring	20-4. 0. 31	Hammer Block Pin
27-2. 2. 01	Cylinder	38-1. 1. 14	Rear Sight Elevation Screw Pin
27-2. 3. 00	Extractor Assembly		
38-3. 1. 00	Right Stock	38-5. 0. 01	Rear Sight Base
38-3. 2. 00	Left Stock	38-5. 0. 02	Rear Sight Windage Screw
20-3. 0. 03	Stock Screw	38-5. 0. 03	Rear Sight Leaf
20-4. 3. 00	Trigger	38-5. 0. 04	Rear Sight Spring
20-4. 0. 02	Hand Lever Spring	38-5. 0. 05	Rear Sight Elevation Screw
20-4. 0. 03	Hand Lever Spring Pin	38-5. 0. 06	Rear Sight Lock Screw



PARTS LIST— RUGER MARK I TARGET AND STANDARD MODELS

Part No.	Description	Part No.	Description
AMC	Magazine complete	A25-J1	Extractor Spring
A	Magazine follower (not illustrated)	A54	Grip Frame, with Trigger Guard
	Magazine follower button (not illustrated)	A100	Grip Frame (Rev.), with Trigger Guard
	Magazine spring (not illustrated)	A5	Magazine Latch
		A30	Magazine Latch Spring
A9C	Mainspring Housing Assembly complete (not illustrated)	A26-1	Magazine Latch Pin
		A26-7	Magazine Latch Stop Pin
		A12	Trigger
A9	Mainspring Housing only	A 34	Trigger Pivot
A1	Bolt Stop Pin	A 34-1	Trigger Pivot Lock Washer
A26-2	Bolt Stop Pin Pivot	A34-2	Trigger Spring
A20-1	Mainspring	A25-H	Trigger Spring Plunger
A25-1	Mainspring Plunger	A11	Disconnector Complete
A41	Detent Ball	A18	Hammer
A7	Housing Latch	A26-5	Hammer Pivot
A26-9	Housing Latch Pivot	A26-E	Hammer Bushing
A52	Barrel and Receiver As-	A10	Hammer Strut

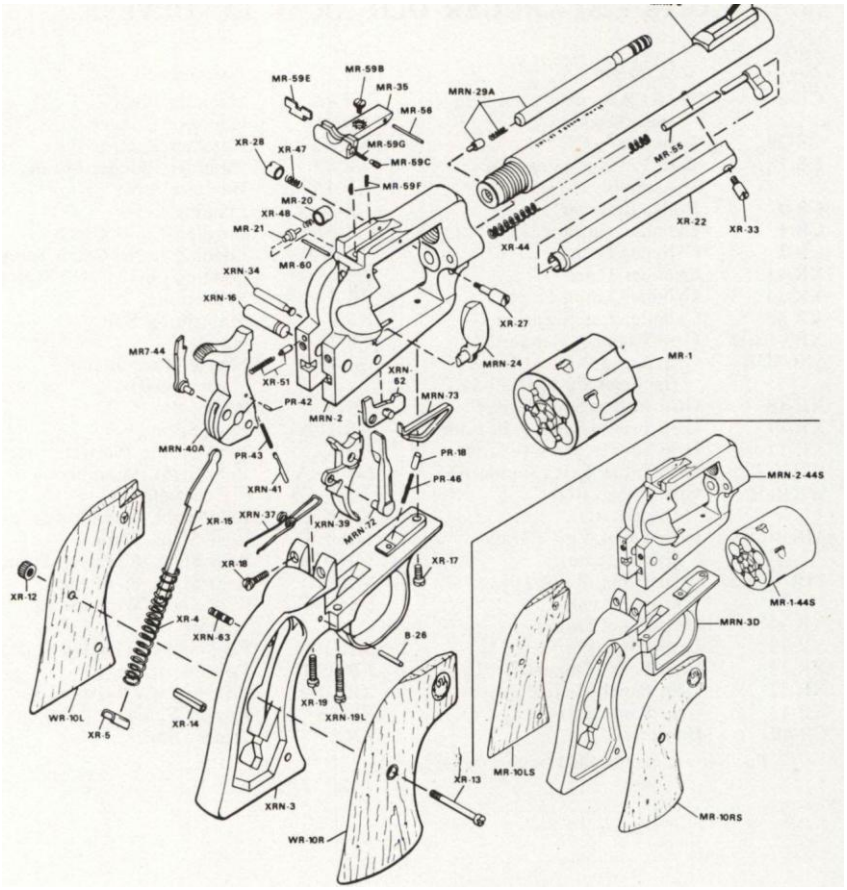
	sembly Complete, (with sights and ejector) (4¾″ or 6″, 5½ ″ or 6⅞″)	A26-4	Hammer Strut Pin
		ASC	Safety Complete
		A19	Sear
A15	Front Sight (must be drilled for cross pin)	A26-8	Sear Pivot
		A31-A	Sear Spring
A26-6	Front Sight Pin	A26-3	Sear Spring Stop Pin
A20	Rear Sight	A-8L	Grip Panel (Rev.), Left
A16	Ejector (not illustrated)	A-8R	Grip Panel (Rev.), Right
A25-A	Ejector Rivet (not illustrated)	A8	Grip Panel, Left
		A8	Grip Panel, Right
ABC	Bolt Assembly Complete (not illustrated)	A-108WR	Grip Panel (Rev.), Walnut, Right
A21	Bolt only Recoil Spring Guide Pin)	A-108WL	Grip Panel (Rev.), Walnut, Left
A38	Recoil Spring Support } Assembly Recoil Spring)	A-108WLT	Grip Panel (Rev.), Walnut, Left with Thumb rest
A13	Firing Pin	A8-WR	Grip Panel, Walnut, Right
A35B	Firing Pin Stop	A8-WL	Grip Panel, Walnut, Left
A39-1	Rebound Spring	A8-WLT	Grip Panel, Walnut, Left with Thumb rest
A3 9	Rebound Spring Support		
A22	Extractor	A28	Medallion
A25-J	Extractor Plunger	A25-C	Grip Panel Screw



PARTS LIST—RUGER OLD ARMY REVOLVERS

Part No.	Description	Part No.	Description
CB-6	*Barrel Assembly Complete (installed)	XR-16	Hammer Pivot
		XR-41	Hammer Plunger
CB-29	Base Pin	XR-42	Hammer Plunger Pin
CB-28	Base Pin Retaining Pin Assembly	XR-43	Hammer Plunger Spring
		XR-15	Hammer Strut
CB-9	Bullet Rammer	CB-8	Loading Lever
CB-1	*Cylinder (installed)	CB-67	Loading Lever Catch
CB-2	*Cylinder Frame	PR-16N	Loading Lever Catch Screw
XR-45	Cylinder Latch	CB-69	Loading Lever Catch Spring
XR-34	Cylinder Latch Pivot	CB-4	Mainspring
XR-46	Cylinder Latch Spring	XR-5	Mainspring Seat
XR3-RED	Grip Frame—Standard	CB-72	Nipple
MR-3DB	Grip Frame—Solid Brass (includes Pt #MR39-S)	CB-73	Nipple Wrench (not illustrated)
XR-18	Grip Frame Screw—Back	CB-7	Pawl
XR-19	Grip Frame Screw—Bottom	XR-50A	Pawl Spring
XR-17	Grip Frame Screw—Front	XR-51	Pawl Spring Plunger
WR10-L	Grip Panel, Left (Standard)	MR-59A	Rear Sight Assembly—Complete
WR10-R	Grip Panel, Right (Standard)	MR-59B	Rear Sight, Elevation Screw
MR-10-LS	Grip Panel, Left (Brass Grip Frame)	MR-59E	Rear Sight, Blade
		MR-59F	Rear Sight, Elevation Spring
MR-10-RS	Grip Panel, Right (Brass Grip Frame)	MR-56	Rear Sight, Pivot Pin
		MR-59C	Rear Sight, Windage Adj. Screw
XR-14	Grip Panel Dowel		
XR-12	Grip Panel Ferrule L. H.	MR-59G	Rear Sight, Windage Spring
XR-11	Grip Panel Ferrule R. H.	XR-39B	Trigger
XR-52	Grip Panel Medallion	XR-34	Trigger Pivot Screw
XR-13	Grip Panel Screw	XR-38	Trigger Plunger
CB-40	Hammer	XR-37	Trigger Spring

* Parts must be installed at the factory.



PARTS LIST—RUGER NEW MODEL BLACKHAWK/ NEW MODEL SUPER BLACKHAWK
(REPLACEMENT PARTS MARKED BY DAGGER MUST BE FITTED BY A PERSON QUALIFIED IN GUN REPAIR)

Part No.	Description	Part No.	Description
*MRN-6- ·357	Barrel— ·357 Magnum Cal. (Specify 4⅝″ or 6½″)	XR-19	Grip Frame Screw—C —Bottom
*MR-6- ·30	Barrel— ·30 Carb. Cal. 7½″ only	XRN-19L	Grip Frame Screw & Pivot Lock
*MR-6- ·41	Barrel— ·41 Magnum Cal. (Specify 4⅝″ or 6½″)	WR-10R	Grip Panel, Right
*MR-6- ·45	Barrel— ·45 Cal. (Specify 4⅝″ or 7½″)	WR-10L	Grip Panel, Left
MRN-29A	Base Pin Assembly	XR-14	Grip Panel Dowel
XR-27	Base Pin Latch	XR-12	Grip Panel Ferrule L. H.
XR-28	Base Pin Latch Nut	XR-11	Grip Panel Ferrule R. H. (Not Illustrated)
XR-47	Base Pin Latch Spring	XR-13	Grip Panel Screw
*MR-1	Cylinder (Specify Caliber)	MRN-40At	Hammer Assembly
MRN-2- ·357	Cylinder Frame (·375 Mag. Cal.) NOT OFFERED	XRN-16	Hammer Pivot
MRN-2- ·30	Cylinder Frame (·30 Carbine Cal.) NOT OFFERED	XRN-41t	Hammer Plunger
MRN-2- ·41	Cylinder Frame (·41 Magnum Cal.) NOT OFFERED	PR-42	Hammer Plunger Pin
MRN-2- ·45	Cylinder Frame (·45 Cal.) NOT OFFERED	PR-43	Hammer Plunger Spring
PR-46	Cylinder Latch Spring	XR-15	Hammer Strut
PR-18	Cylinder Latch Spring Plunger	XR-4	Mainspring
XRN-62	Cylinder Latch	XR-5	Mainspring Seat
XR-22	Ejector Housing	XR-52	Medallion (Not Illustrated)
XR-33	Ejector Housing Screw (·357 ·30 Carb. and ·45)	MR7-44	Pawl
		XR-51	Pawl Spring and Plunger
		MR-35	Rear Sight Assembly Complete
		MR-59H	Rear Sight Detent Ball (Not Illustrated)
		MR-59E	Rear Sight Blade
		MR-59B	Rear Sight Elevation

XR-33-44N	Ejector Housing Screw (·41 and ·44 Mag.)		Screw
MR-55	Ejector Rod Assembly	MR-59F	Rear Sight Elevation Spring (2 Req'd)
XR-44	Ejector Rod Spring	MR-56	Rear Sight Pivot Pin
MR-21t	Firing Pin	MR-59C	Rear Sight Windage Adjusting Screw
*MRN-36	Front Sight (Specify Cal.)	MR-59G	Rear Sight Windage Spring
XR-48	Firing Pin Rebound Spring	MR-20t	Recoil Plate
MRN-24t	Gate	MR-60t	Recoil Plate Cross Pin
MRN-73	Gate Detent Spring & Retainer	MRN-72t	Transfer Bar
		XRN-39t	Trigger
XRN-3t	Grip Frame	XRN-34	Trigger Pivot
XR-17	Grip Frame Screw—A —Front	XRN-37	Trigger Spring
		B-26	Trigger Spring Pin
XR-18	Grip Frame Screw—B —Back (2 Req'd)	XRN-63	Trigger Spring Retaining Pin

* Parts must be installed at the factory.

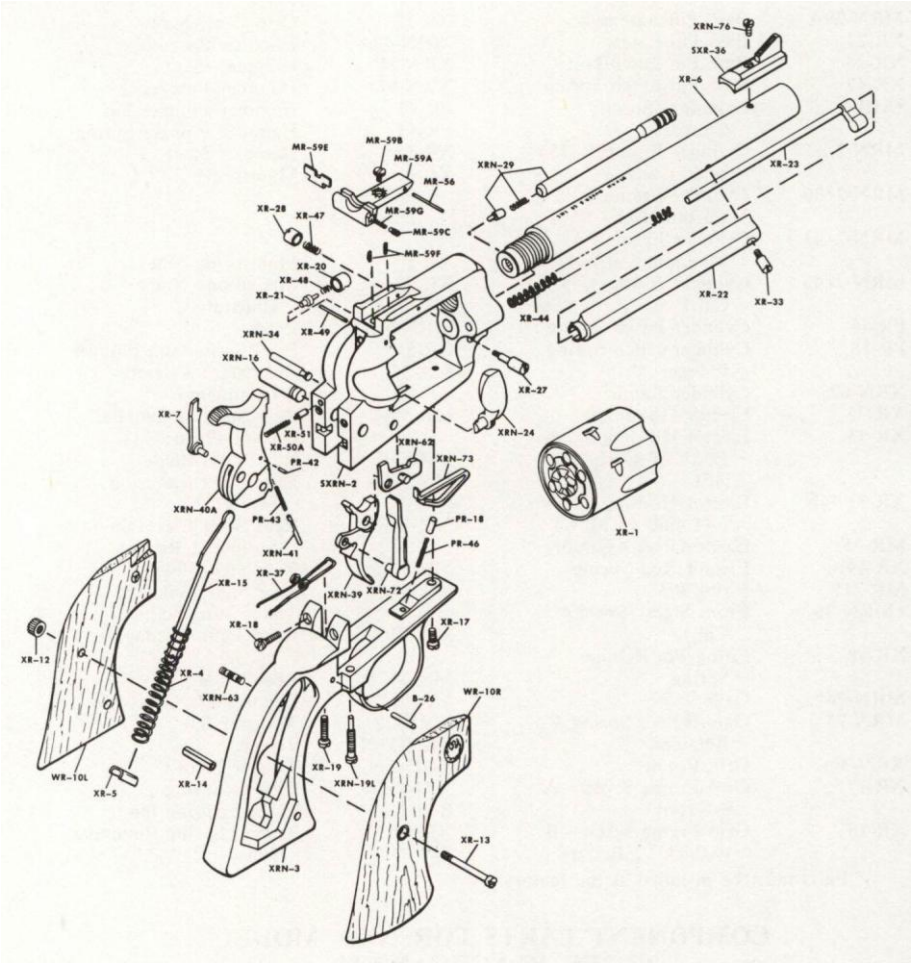
COMPONENT PARTS FOR NEW MODEL SUPER BLACKHAWK**

Part No.	Description	Part No.	Description
*MR-6-44	Barrel (7½″ Only)	XRN-39St	Trigger (Serrated) (Not illustrated)
MR-1-44S	Cylinder (Unfluted Only)	MR-35	Rear Sight Assembly Complete
MRN-2-44S	Cylinder Frame		
MRN-3Dt	Grip Frame (Steel) See Note Below	MR-10LS	Walnut Grip Panel, Left Complete
MRN-3DBt	Grip Frame (Brass) See Note Below	MR-10RS	Walnut Grip Panel, Right Complete
MRN-40-44St	Hammer (Not Illustrated)		

GRIP FRAME NOTE: New Model Super Blackhawk grip frame will fit any New Model "Single-Six" or New Model "Blackhawk" revolver. However, since grip frame must be "match-polished" to cylinder frame, the steel grip frame is furnished only "in the white" (non-blued) and brass grip frame furnished a little oversize on the sides. These grip frames are supplied with the XRN-39S trigger.

* Parts must be installed at the factory.

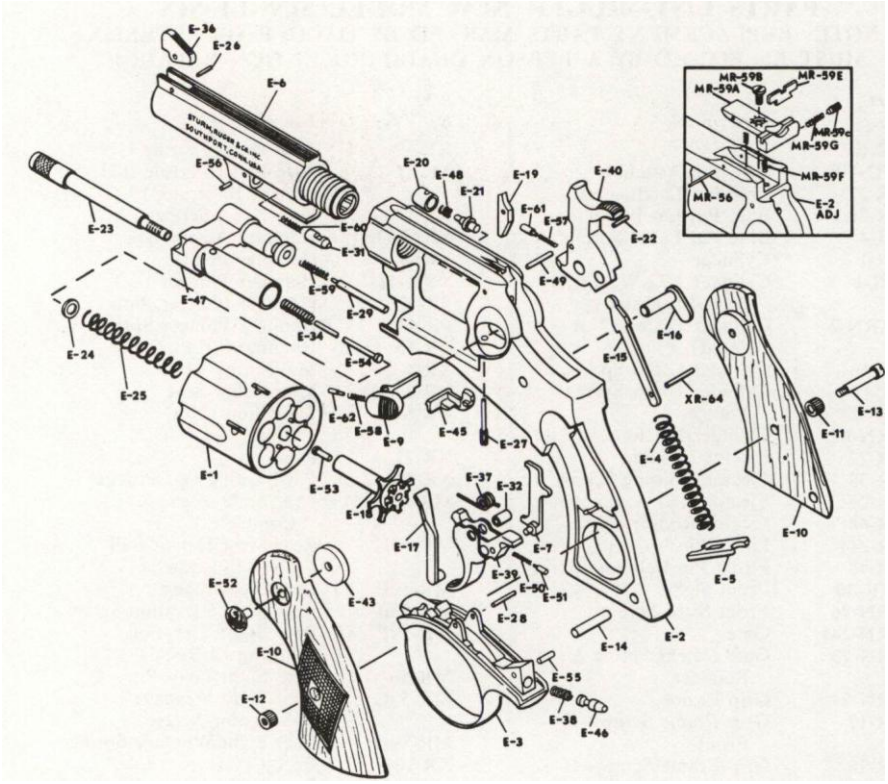
** All other New Model Super Blackhawk parts are interchangeable with corresponding New Model Blackhawk parts.



PARTS LIST—RUGER NEW MODEL SINGLE-SIX
(NOTE: REPLACEMENT PARTS MARKED BY DAGGER OR ASTERISK MUST BE FITTED BY A PERSON QUALIFIED IN GUN REPAIR.)

Part No.	Description	Part No.	Description
XR-6	* Barrel	XR-12	Grip Panel Ferrule L. H.
XRN-29	Base Pin Assembly	XR-11	Grip Panel Ferrule R. H. (Not Illustrated)
XR-27	Base Pin Latch		
XR-28	Base Pin Latch Nut	XR-13	Grip Panel Screw
XR-47	Base Pin Latch Spring	XRN-40At	Hammer Assembly
XR-1	* Cylinder	XRN-16	Hammer Pivot
WR-1	* Cylinder (·22 W. M. R.) (Not Illustrated)	XRN-41t	Hammer Plunger
		PR-42	Hammer Plunger Pin
SXRN-2	Cylinder Frame (Not Offered)	PR-43	Hammer Plunger Spring
		XR-15	Hammer Strut
PR-46	Cylinder Latch Spring	XR-4	Mainspring
PR-18	Cylinder Latch Spring Plunger	XR-5	Mainspring Seat
		XR-52	Medallion (Not Illustrated)
XRN-62	Cylinder Latch		
XR-22	Ejector Housing	XR-7t	Pawl
XR-33	Ejector Housing Screw	XR-51	Pawl Spring and Plunger
XR-23	Ejector Rod Assembly	MR-35	Rear Sight Assembly Complete
XR-44	Ejector Rod Spring		
XR-21t	Firing Pin	MR-59H	Rear Sight Detent Ball (Not Illustrated)
XR-48	Firing Pin Rebound Spring		
SXR-36	Front Sight	MR-59E	Rear Sight Blade
XRN-76	Front Sight Screw	MR-59B	Rear Sight Elevation Screw
XRN-24t	Gate	MR-59F	Rear Sight Elevation Spring (2 Req'd)
XRN-73	Gate Detent Spring & Retainer		
		MR-56	Rear Sight Pivot Pin
XRN-3t	Grip Frame	MR-59C	Rear Sight Windage Adjusting Screw
XR-17	Grip Frame Screw—A—Front		
		MR-59G	Rear Sight Windage Spring
XR-18	Grip Frame Screw—B—Back (2 Req'd)	XR-20t	Recoil Plate
		XR-49t	Recoil Plate Cross Pin

XR-19	Grip Frame Screw—C—Bottom	XRN-72t	Transfer Bar
		XRN-39t	Trigger
XRN-19L	Grip Frame Screw & Pivot Lock	XRN-34	Trigger Pivot
		XRN-37	Trigger Spring
WR-10R	Grip Panel, Right	B-26	Trigger Spring Pin
WR-10L	Grip Panel, Left	XRN-63	Trigger Spring Retaining Pin
XR-14	Grip Panel Dowel		

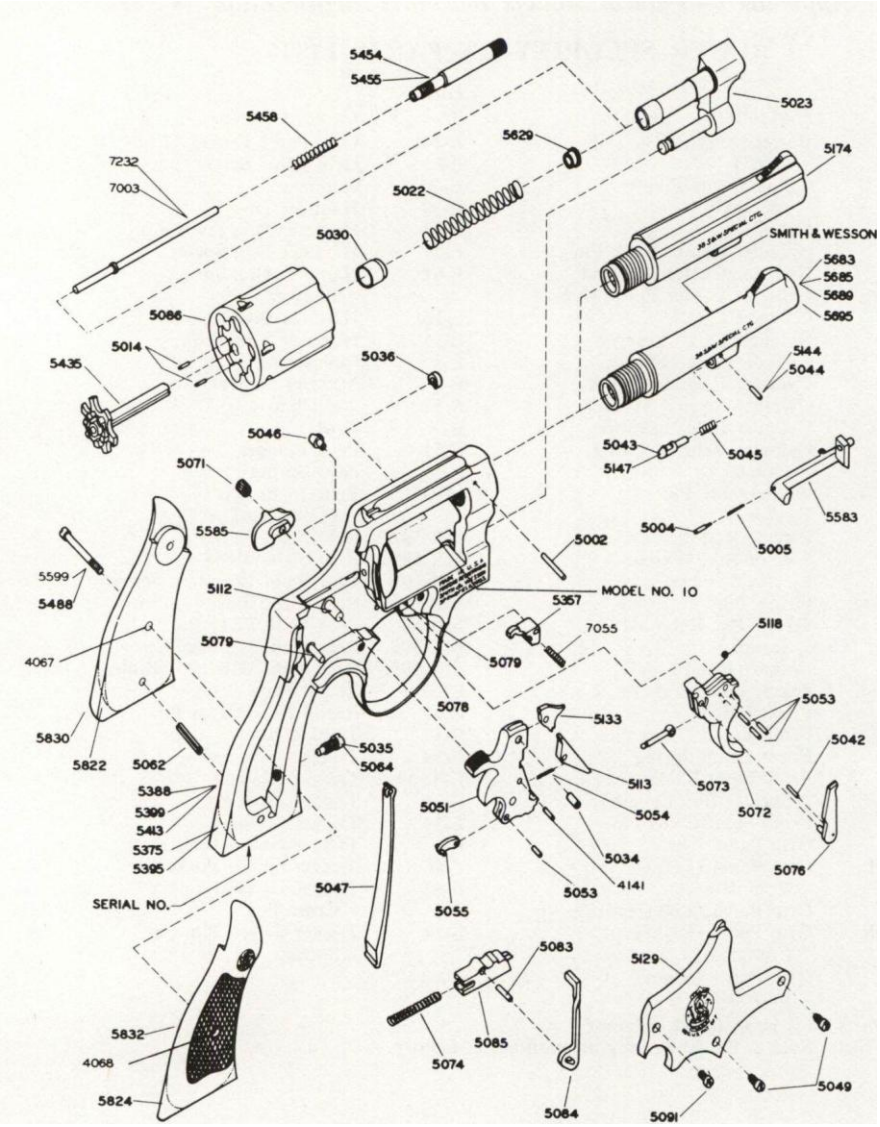


RUGER SECURITY·SIX PARTS LIST

Part No.	Description	Part No.	Description
*E-6	Barrel (Specify 2¾″, 4″ or 6″)	E-14	Grip Panel Dowel
		E-13	Grip Panel Screw
E-47	Crane/Crane Pivot Assembly	E-40	Hammer
		E-19	Hammer Dog
*E-1	Cylinder	E-22	Hammer Dog Pivot Pin
E-53	Cylinder Center Lock Pin	E-57	Hammer Dog Spring
E-54	Cylinder Center Pin Rod	E-61	Hammer Dog Spring Plunger
E-34	Cylinder Center Pin Spring		
E-45	Cylinder Latch	E-16	Hammer Pivot Assem.
E-29	Cylinder Latch Plunger	E-15	Hammer Strut
E-59	Cylinder Latch Spring	E-4	Mainspring
E-9	Cylinder Release Button	E-5	Mainspring Seat
E-27	Cylinder Release Pivot	E-52	Medallion
E-58	Cylinder Release Spring	E-7	Pawl
E-62	Cylinder Release Spring Plunger	E-51	Pawl Plunger
		E-50	Pawl Spring
XR-64	Disassembly Pin	MR-35	Rear Sight Ass’y (Complete)
E-18	Ejector		
E-23	Ejector Rod	MR-59A	Rear Sight
E-24	Ejector Rod Washer	MR-59E	Rear Sight Blade
E-25	Ejector Spring	MR-59B	Rear Sight Elevation Screw
E-21	Firing Pin	MR-59F	Rear Sight Elevation Spring
E-48	Firing Pin Rebound Spring	MR-56	Rear Sight Pivot Pin
		MR-59C	Rear Sight Windage Screw
*E-2	Frame (Fixed Sight)	MR-59G	Rear Sight Windage Spring
*E-2 adj.	Frame (Adj. Sight)	*E-20	Recoil Plate
E-31	Front Latch	E-49	Recoil Plate Cross Pin
E-56	Front Latch Cross Pin	E-17	Transfer Bar
E-60	Front Latch Spring	E-39	Trigger
E-36	Front Sight Blade (Specify Bbl. Length)	E-32	Trigger Bushing
		E-28	Trigger Pivot Pin
E-26	Front Sight Cross Pin	E-37	Trigger Spring
E-43	Grip Panel Boss	**E-3	Trigger Guard (only)
E-10L	Grip Panel (Left) Complete	E-46	Trigger Guard Plunger
		E-55	Trigger Guard Plunger Cross Pin
E-12	Grip Panel (Left) Ferrule		
E-10R	Grip Panel (Right)	E-38	Trigger Guard Plunger

E-11	Complete Grip Panel (Right) Ferrule		Spring

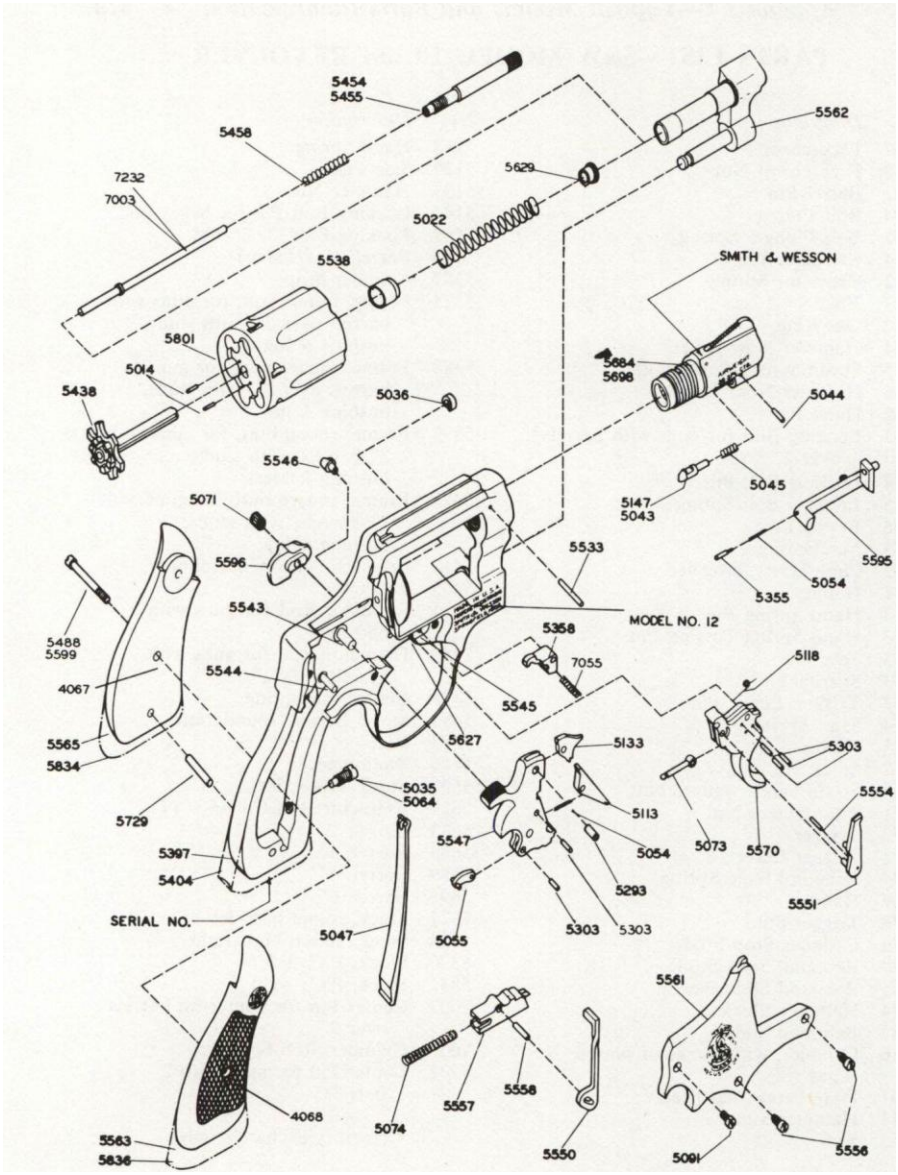
* Parts must be installed at factory.
** Note: Sold in the white only unless fitted at factory.



PARTS LIST-S&W MODEL 10 ·38 REVOLVER

Part No.	Description	Part No.	Description
4067	Escutcheon	5118	Hand Spring
4068	Escutcheon Nut	5129	Side Plate
5002	Barrel Pin	5133	Hammer Nose
5004	Bolt Plunger	5144	Locking Bolt Pin for heavy bbl.
5005	Bolt Plunger Spring	5147	Locking Bolt for 2″ bbl.
5014	Extractor Pin	5174	Barrel, 4″ (Heavy)
5022	Extractor Spring	5357	Cylinder Stop
5023	Yoke	5375	*Frame, round butt, for guns with barrels over 2″, with studs, bushing & lug
5030	Gas Ring		
5034	Hammer Nose Rivet		
5035	Strain Screw, round butt	5388	* Frame, square butt, for guns with barrels over 2″, with studs, bushing & lug
5036	Hammer Nose Bushing		
5042	Hand Pin		
5043	Locking Bolt for guns with barrels over 2″	5395	*Frame, round butt, for guns with 2″ barrels, with studs, bushing & lug
5044	Locking Bolt Pin		
5045	Locking Bolt Spring	5399	*Frame, square butt, for guns with 2″ barrels, with studs, bushing & lug
5046	Frame Lug		
5047	Mainspring		
5049	Plate Screw, crowned	5413	*Frame for heavy barrel only
5051	Hammer	5435	Extractor
5053	Hand Spring Pin	5454	Extractor Rod for guns with 2″ barrels
5053	Hand Spring Torsion Pin		
5053	Sear Pin	5455	Extractor Rod for guns with barrels over 2″
5053	Stirrup Pin		
5053	Trigger Lever Pin	5458	Center Pin Spring

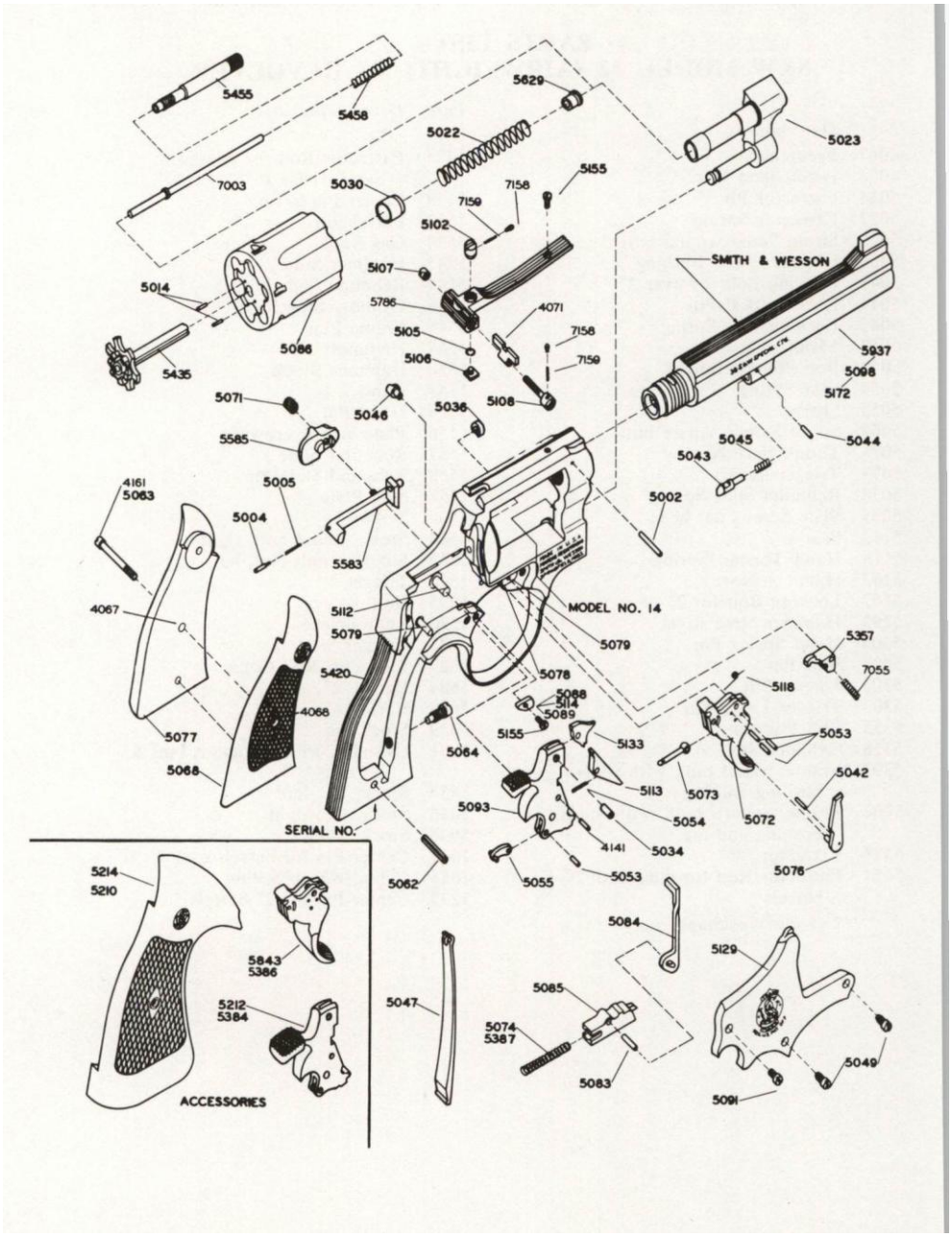
5054	Sear Spring	5488	Stock Screw, round butt
5055	Stirrup	5583	Bolt
5062	Stock Pin	5585	Thumbpiece
5064	Strain Screw, square butt	5599	Stock Screw, P. C.
5071	Thumbpiece Nut	5629	Extractor Rod Collar
5072	Trigger	5683	Barrel, 2″
5073	Trigger Lever	5685	Barrel, A″
5074	Rebound Slide Spring	5689	Barrel, 5″
5076	Hand	5695	Barrel, 6″
5078	Trigger Stud	5822	Stock, round butt, left
5079	Cylinder Stop Stud	5824	Stock, round butt, right
5079	Rebound Slide Stud	5830	Stock, P. C., left
5083	Rebound Slide Pin	5832	Stock, P. C., right
5084	Hammer Block	7003	Center Pin for guns with barrels over 2″
5085	Rebound Slide		
5086	Cylinder, with extractor pins & gas ring	7055	Cylinder Stop Spring
		7232	Center Pin for guns with 2″ barrels
5091	Plate Screw, flat head		
5112	Hammer Stud		
5113	Sear		* (factory exchange only)



PARTS LIST— S&W MODEL 12 (AIRWEIGHT) ·38 REVOLVER

Part No.	Description	Part No.	
4067	Escutcheon	5455	Extractor Rod for guns with barrels over 2″
4068	Escutcheon Nut		
5014	Extractor Pin	5458	Center Pin Spring
5022	Extractor Spring	5533	Barrel Pin
5035	Strain Screw, round butt	5538	Gas Ring
5036	Hammer Nose Bushing	5543	Hammer Stud
5043	Locking Bolt for over 2″	5544	Rebound Slide Stud
5044	Locking Bolt Pin	5545	Cylinder Stop Stud
5045	Locking Bolt Spring	5546	Frame Lug
5047	Mainspring	5547	Hammer
5054	Bolt Plunger Spring	5550	Hammer Block
5054	Sear Spring	5551	Hand
5055	Stirrup	5554	Hand Pin
5064	Strain Screw, square butt	5556	Plate Screw, crowned
5071	Thumbpiece Nut	5557	Rebound Slide
5073	Trigger Lever	5558	Rebound Slide Pin
5074	Rebound Slide Spring	5561	Side Plate
5091	Plate Screw, flat head	5562	Yoke
5113	Sear	5563	Stock, round butt, right
5118	Hand Torsion Spring	5565	Stock, round butt, left
5133	Hammer Nose	5570	Trigger
5147	Locking Bolt for 2″	5595	Bolt
5293	Hammer Nose Rivet	5596	Thumbpiece
5303	Hand Spring Pin	5627	Trigger Stud

5303	Sear Pin	5629	Extractor Rod Collar
5303	Stirrup Pin	5684	Barrel, 2″
5303	Trigger Lever Pin	5698	Barrel, 4″
5355	Bolt Plunger	5729	Stock Pin
5358	Cylinder Stop	5801	Cylinder, with extractor, pins & gas ring
5397	* Frame, round butt, with studs, bushing and lug	5834	Stock, PC, left
5404	* Frame, square butt, with studs, bushing and lug	5836	Stock, PC, right
		5936	Stock Screw
5438	Extractor	7003	Center Pin for barrels over 2″
5454	Extractor Rod for guns with 2″ barrels * (factory exchange only)	7055	Cylinder Stop Spring
		7232	Center Pin for 2″ barrels

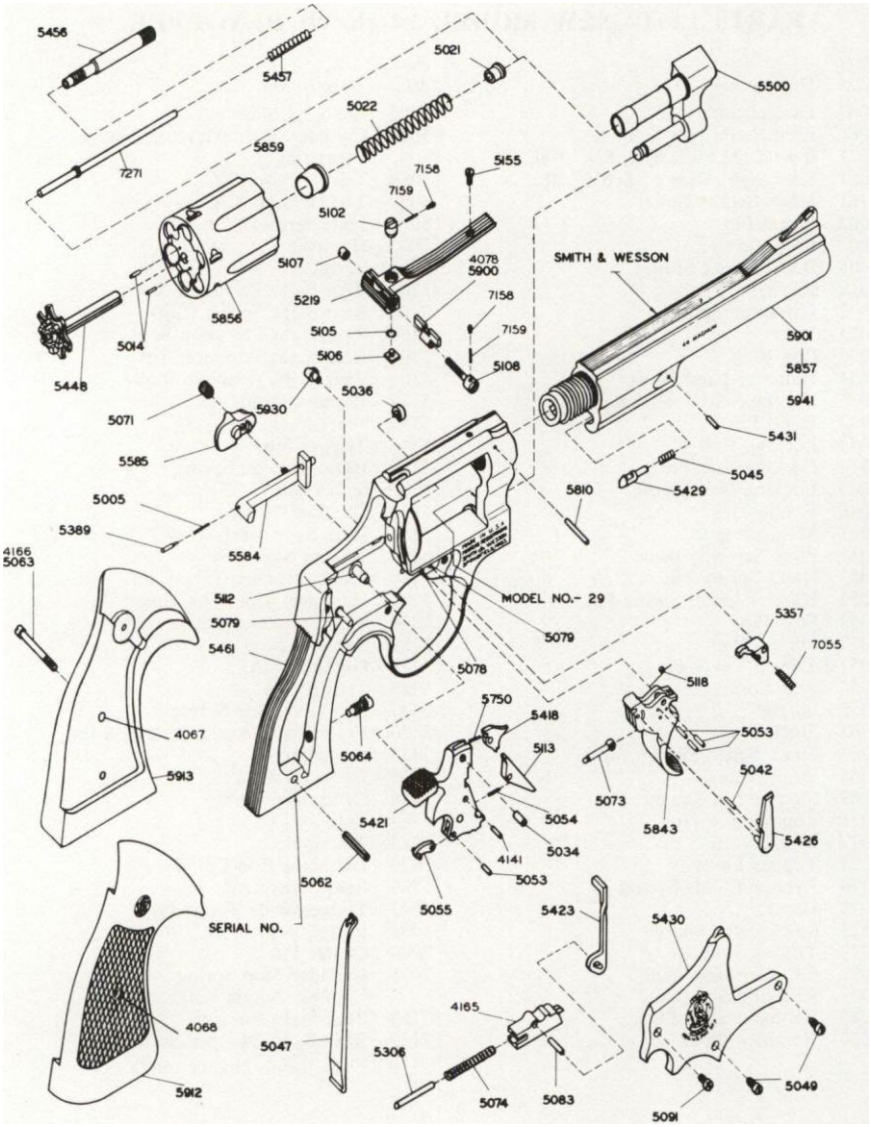


PARTS LIST-S&W MODEL 14 (K-38) REVOLVER

Part No.	Description	Part No.	Description
4067	Escutcheon	5085	Rebound Slide
4068	Escutcheon Nut	5086	Cylinder, with extractor, pins &
4071	Rear Sight Slide 6″ & 8⅜″ Bbl.		gas ring
4081	Rear Sight Slide 6″ & 8⅜″ Bbl.	5088	Trigger Stop ·500
4161	Stock Screw Target	5089	Trigger Stop S. A.
5002	Barrel Pin	5091	Plate Screw, flat head
5004	Bolt Plunger	5093	Hammer
5005	Bolt Plunger Spring	5098	Barrel, 6″
5014	Extractor Pin	5102	Rear Sight Elevation Nut
5022	Extractor Spring	5105	Rear Sight Spring Clip
5023	Yoke	5106	Rear Sight Elevation Stud
5030	Gas Ring	5107	Rear Sight Windage Nut
5034	Hammer Nose Rivet	5108	Rear Sight Windage Screw
5036	Hammer Nose Bushing	5112	Hammer Stud
5042	Hand Pin	5113	Sear
5043	Locking Bolt	5114	Trigger Stop
5044	Locking Bolt Pin	5118	Hand Torsion Spring
5045	Locking Bolt Spring	5129	Side Plate
5046	Frame Lug	5133	Hammer Nose
5047	Mainspring	5155	Rear Sight Leaf Screw
5049	Plate Screw, crowned	5155	Trigger Stop Screw

5053	Hand Spring Pin	5210	Stock, oversize Target, left
5053	Hand Torsion Spring Pin	5212	Hammer, wide spur Target
5053	Sear Pin	5214	Stock, oversize Target, right
5053	Stirrup Pin	5357	Cylinder Stop
5053	Trigger Lever Pin	5384	Hammer S. A.
5054	Sear Spring	5386	Trigger S. A.
5055	Stirrup	5387	Rebound Slide Spring
5062	Stock Pin	5420	*Frame, with studs, bushing & lug
5063	Stock Screw Square Butt	5435	Extractor
5064	Strain Screw	5455	Extractor Rod
5068	Stock, right Square	5458	Center Pin Spring
5071	Thumbpiece Nut	5583	Bolt
5072	Trigger	5585	Thumbpiece
5073	Trigger Lever	5629	Extractor Rod Collar
5074	Rebound Slide Spring	5786	Rear Sight Leaf
5076	Hand	5843	Trigger, wide Target type
5077	Stock, left Square	5937	Barrel, 8⅜″
5078	Trigger Stud	7003	Center Pin
5079	Cylinder Stop Stud	7055	Cylinder Stop Spring
5079	Rebound Slide Stud		Single Action Kit
5083	Rebound Slide Pin	7158	Rear Sight Plunger
5084	Hammer Block	7159	Rear Sight Plunger Spring

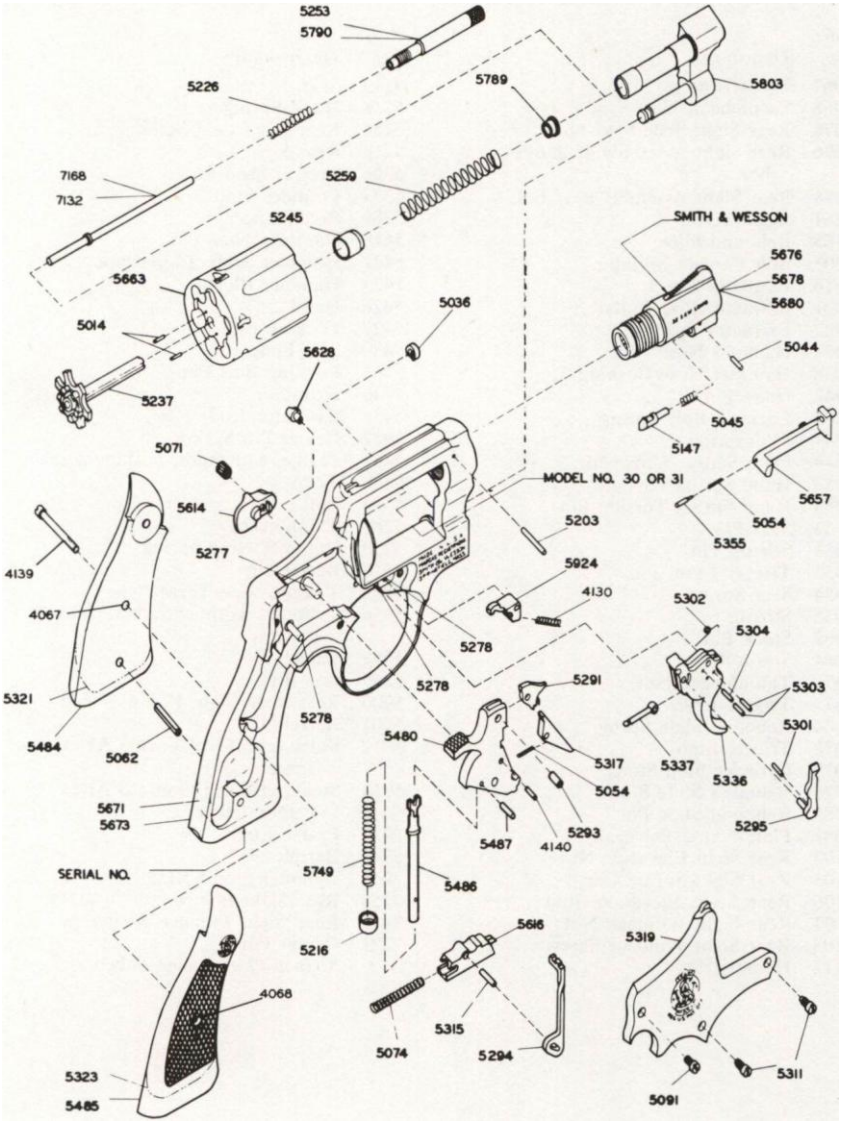
* (factory exchange only)



PARTS LIST-S&W MODEL 29 (·44 MAG.) REVOLVER

Part No.	Description	Part No.	Description
4067	Escutcheon	5113	Sear
4068	Escutcheon Nut	5118	Hand Spring
4078	Rear Sight Slide 8⅜″ bbl.	5155	Rear Sight Leaf Screw
4096	Rear Sight Assembly 4″ & 6½″ bbl.	5219	Rear Sight Leaf
		5306	Trigger Stop Rod
4098	Rear Sight Assembly 8⅜″ bbl.	5357	Cylinder Stop
4161	Stock Screw	5389	Bolt Plunger
4165	Rebound Slide	5418	Hammer Nose
5005	Bolt Plunger Spring	5421	Hammer, wide Target type
5014	Extractor Pin	5423	Hammer Block
5021	Extractor Rod Collar	5426	Hand
5022	Extractor Spring	5429	Locking Bolt
5034	Hammer Nose Rivet	5430	Side Plate
5036	Hammer Nose Bushing	5431	Locking Bolt Pin
5042	Hand Pin	5448	Extractor
5045	Locking Bolt Spring	5456	Extractor Rod
5047	Mainspring	5457	Center Pin Spring
5049	Plate Screw, Crowned	5461	*Frame, with studs, bushing & lug
5053	Hand Spring Pin	5500	Yoke
5053	Hand Spring Torsion Pin	5584	Bolt
5053	Sear Pin	5585	Thumbpiece
5053	Stirrup Pin	5750	Hammer Nose Spring
5053	Trigger Lever Pin	5810	Barrel Pin
5054	Sear Spring	5843	Trigger, wide Target type
5055	Stirrup	5856	*Cylinder, with extractor, pins & gas ring
5062	Stock Pin		

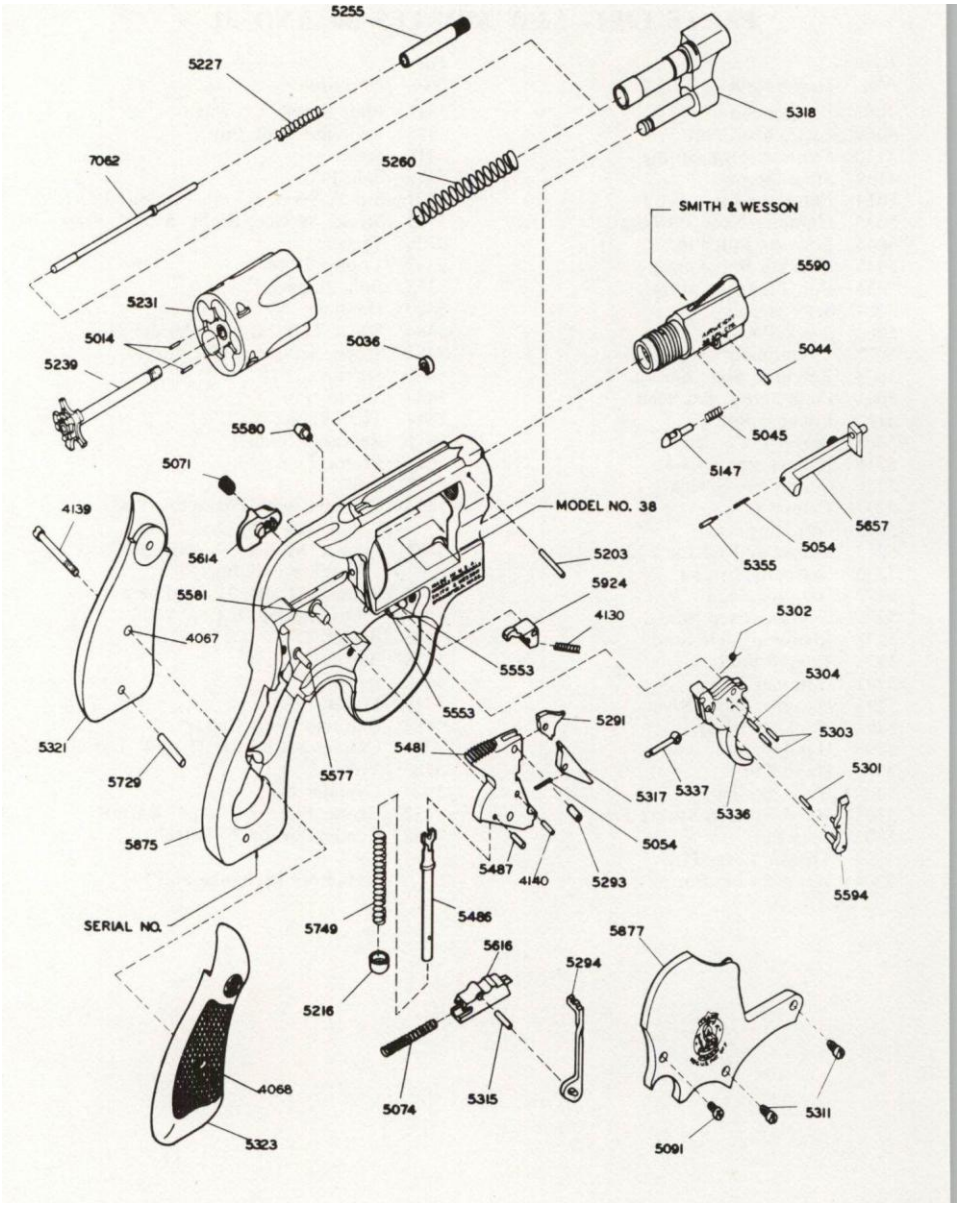
5064	Strain Screw	5857	*Barrel, 6½″
5071	Thumbpiece Nut	5859	Gas Ring
5073	Trigger Lever	5900	Rear Sight Slide 4″ & 6½″ bbl.
5074	Rebound Slide Spring	5901	*Barrel, 4″
5078	Trigger Stud	5912	Stock, checked Goncalo Alves
5079	Cylinder Stop Stud		Target, right
5079	Rebound Slide Stud	5913	Stock, checked Goncalo Alves
5083	Rebound Slide Pin		Target, left
5091	Plate Screw, flat head	5930	Frame Lug
5102	Rear Sight Elevation Nut	5941	*Barrel, 8⅜″
5105	Rear Sight Spring Clip	7055	Cylinder Stop Spring
5106	Rear Sight Elevation Stud	7158	Rear Sight Plunger
5107	Rear Sight Windage Nut	7159	Rear Sight Plunger Spring
5108	Rear Sight Windage Screw	7271	Center Pin
5112	Hammer Stud		* (factory exchange only)



PARTS LIST-S&W MODELS 30 AND 31

Part No.	Description	Part No.	Description
4067	Escutcheon	5311	Plate Screw, Crowned
4068	Escutcheon Nut	5315	Rebound Slide Pin
4130	Cylinder Stop Spring	5317	Sear
4139	Stock Screw	5319	Side Plate
5014	Extractor Pin	5321	Stock, Service, Left, Model 30
5036	Hammer Nose Bushing	5323	Stock, Service, Right, Model 30
5044	Locking Bolt Pin	5336	Trigger
5045	Locking Bolt Spring	5337	Trigger Lever
5054	Bolt Plunger Spring	5355	Bolt Plunger
5054	Sear Spring	5480	Hammer
5062	Stock Pin	5484	Stock, Service, Left, Model 31
5071	Thumbpiece Nut	5485	Stock, Service, Right, Model 31
5074	Rebound Slide Spring	5486	Stirrup
5091	Plate Screw, flat head	5487	Stirrup Pin
5147	Locking Bolt	5614	Thumbpiece
5203	Barrel Pin	5616	Rebound Slide
5216	Mainspring Swivel	5628	Frame Lug
5226	Center Pin Spring	5657	Bolt
5237	Extractor	5663	Cylinder, with Extractor, Pins and Gas Ring
5245	Gas Ring		
5253	Extractor Rod for 2″ Barrel	5671	* Frame, Model 30, with studs, bushing and lug
5259	Extractor Spring		
5277	Hammer Stud	5673	*Frame, Model 31, with studs, bushing and lug
5278	Cylinder Stop Stud		
5278	Rebound Slide Stud	5676	Barrel, 2″
5278	Trigger Stud	5678	Barrel, 3″

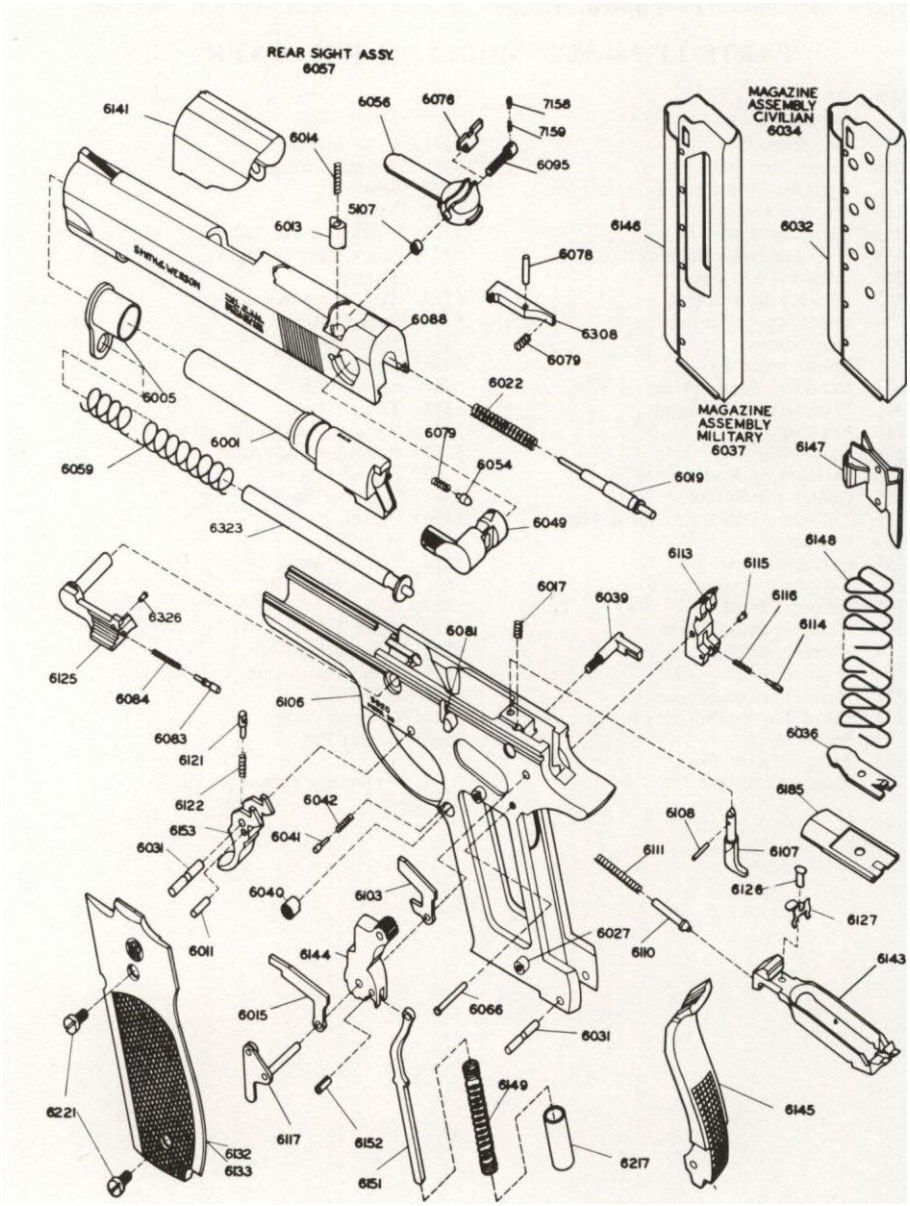
5291	Hammer Nose	5680	Barrel, 4″
5293	Hammer Nose Rivet	5749	Mainspring
5294	Hammer Block	5789	Extractor Rod Collar
5295	Hand	5790	Extractor Rod for 3″ or 4″ Barrels
5301	Hand Pin	5803	Yoke
5302	Hand Spring	5924	Cylinder Stop
5303	Hand Torsion Spring Pin	7132	Center Pin for 3″ or 4″ Barrels
5303	Sear Pin	7168	Center Pin for 2″ Barrel
5303	Trigger Lever Pin		
5304	Hand Spring Pin		* (factory exchange only)



PARTS LIST-S&W MODEL ·38 REVOLVER

Part No.	Description	Part No.	Description
4067	Escutcheon	5311	Yoke Screw
4068	Escutcheon Nut	5315	Rebound Slide Pin
4130	Cylinder Stop Spring	5317	Sear
4139	Stock Screw	5318	Yoke
5014	Extractor Pin	5321	Stock, Service, left
5036	Hammer Nose Bushing	5323	Stock, Service, right
5044	Locking Bolt Pin	5336	Trigger
5045	Locking Bolt Spring	5337	Trigger Lever
5054	Bolt Plunger Spring	5355	Bolt Plunger
5054	Sear Spring	5481	Hammer
5071	Thumbpiece Nut	5486	Stirrup
5074	Rebound Slide Spring	5487	Stirrup Pin
5091	Plate Screw, flat head	5553	Trigger Stud
5147	Locking Bolt	5553	Cylinder Stop Stud
5203	Barrel Pin	5577	Rebound Slide Stud
5216	Mainspring Rod Swivel	5580	Frame Lug
5227	Center Pin Spring	5581	Hammer Stud
5231	Cylinder, with Extractor & Pins	5590	Barrel, 2″
5239	Extractor	5594	Hand
5255	Extractor Rod	5614	Thumbpiece
5260	Extractor Spring	5616	Rebound Slide
5291	Hammer Nose	5657	Bolt
5293	Hammer Nose Rivet	5729	Stock Pin

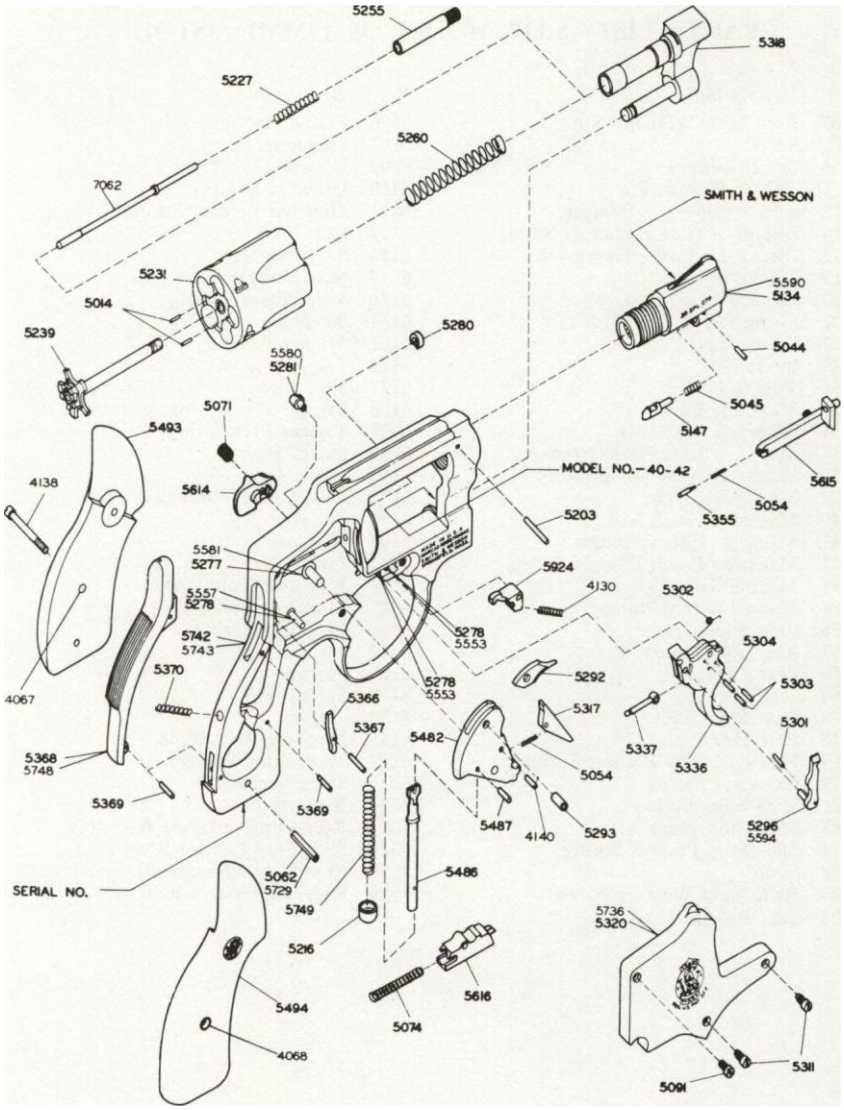
5294	Hammer Block	5749	Mainspring
5301	Hand Pin	5875	*Frame, with stud, bushing & lug
5302	Hand Torsion Spring	5877	Side Plate
5303	Hand Torsion Spring Pin	5924	Cylinder Stop
5303	Sear Pin	7062	Center Pin
5303	Trigger Lever Pin		
5304	Hand Spring Pin		* (factory exchange only)



PARTS LIST-S&W MODEL 39 (9MM) PISTOL

Part No.	Description	Part No.	Description
5107	Rear Sight Windage Nut	6106	Frame (factory exchange only)
6001	Barrel	6107	Disconnector
6005	Barrel Bushing	6108	Disconnector Pin
6011	Trigger Plunger Pin	6110	Drawbar Plunger
6013	Ejector-depressor Plunger	6111	Drawbar Plunger Spring
6014	Ejector-depressor Plunger Spring	6113	Sear
6015	Ejector Magazine Depressor	6114	Sear Plunger
6017	Ejector Spring	6115	Sear Plunger Pin
6019	Firing Pin	6116	Sear Plunger Spring
6022	Firing Pin Spring	6117	Sideplate
6027	Frame Stud	6121	Trigger Plunger
6031	Insert Pin	6122	Trigger Plunger Spring
6031	Trigger Pin	6125	Slide Stop
6032	Magazine Tube	6126	Trigger Play Spring Rivet
6034	Magazine Assembly	6127	Trigger Play Spring
6036	Magazine Butt Plate Catch	6132	Stock, Right
6037	Magazine Assembly-Military	6133	Stock, Left
6039	Magazine Catch	6141	Dust Shield—Military
6040	Magazine Catch Nut	6143	Drawbar
6041	Magazine Catch Plunger	6144	Hammer
6042	Magazine Catch Plunger Spring	6145	Insert
6049	Manual Safety	6146	Magazine Tube—Military
6054	Manual Safety Plunger	6147	Magazine Follower

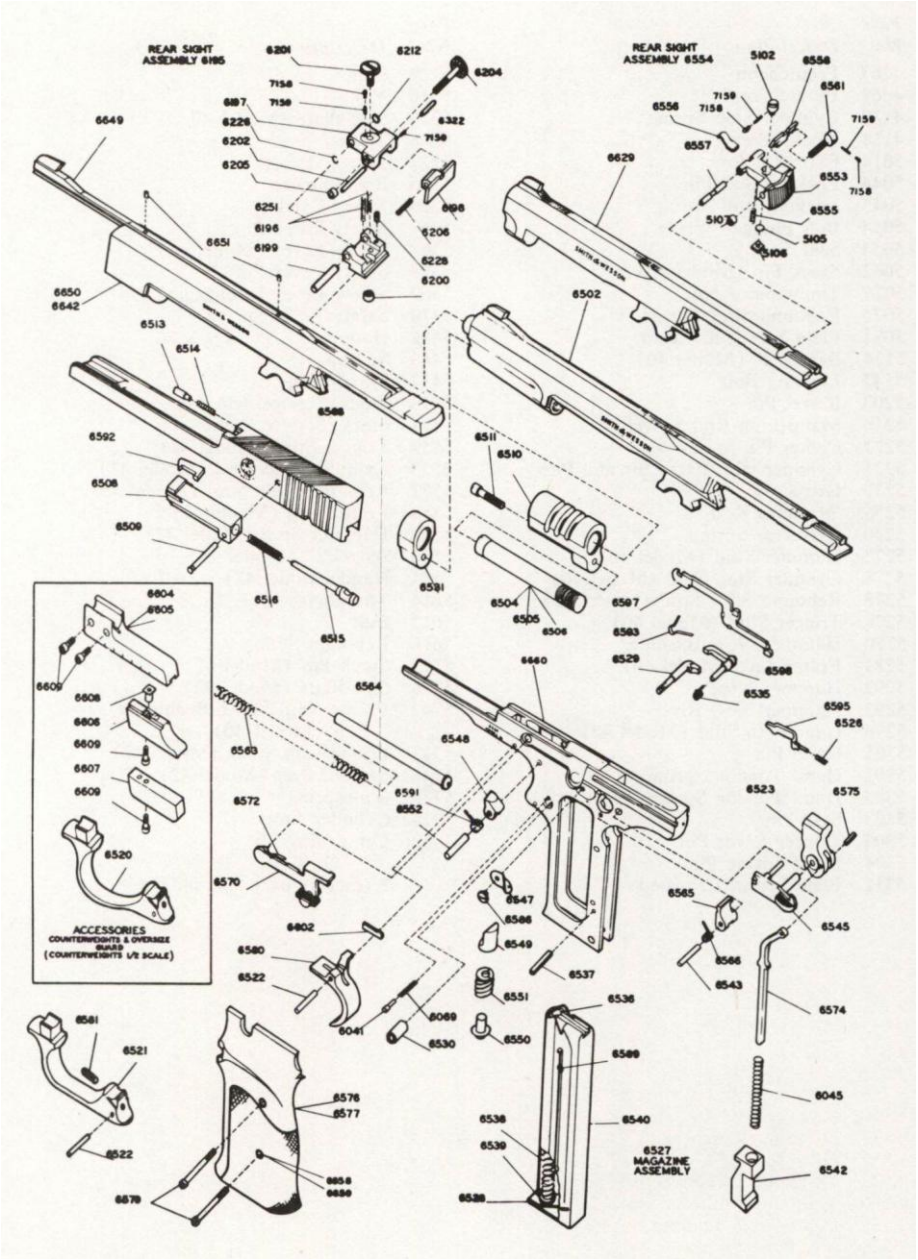
6056	Rear Sight Leaf	6148	Magazine Spring
6057	Rear Sight Assembly	6149	Mainspring
6059	Recoil Spring	6151	Stirrup
6066	Sear Pin	6152	Stirrup Pin
6076	Rear Sight Slide	6153	Trigger
6078	Extractor Pin	6185	Magazine Butt Plate
6079	Manual Safety Plunger Spring	6217	Mainspring Plunger
6079	Extractor Spring	6221	Stock Screw
6081	Slide Stop Button	6308	Extractor
6083	Slide Stop Plunger	6323	Recoil Spring Guide Assembly
6084	Slide Stop Plunger Spring	6326	Slide Stop Plunger Rivet
6088	Slide	7158	Rear Sight Windage Screw Plunger
6095	Rear Sight Windage Screw	7159	Rear Sight Windage Sc. Pig. Sprg.
6103	Sear Release Lever		



PARTS LIST-S&W MODEL 40 & 42 REVOLVER

Part No.	Description	Part No.	Description
4067	Escutcheon	5317	Sear
4068	Escutcheon Nut	5318	Yoke
4130	Cylinder Stop Spring	5320	Side Plate (Model 40
4138	Stock Screw	5336	Trigger
5014	Extractor Pin	5337	Trigger Lever
5044	Locking Bolt Pin	5355	Bolt Plunger
5045	Locking Bolt Spring	5366	Safety Latch
5054	Bolt Plunger Spring	5367	Safety Latch Pin
5054	Sear Spring	5368	Safety Lever (Model 40)
5062	Stock Pin (Model 40)	5369	Safety Lever Pin
5071	Thumbpiece Nut	5369	Safety Lever Disengaging Pin
5074	Rebound Slide Spring	5370	Safety Lever Spring
5091	Plate Screw, flat head	5482	Hammer
5134	Barrel, 2″ (Model 40)	5486	Stirrup
5147	Locking Bolt	5487	Stirrup Pin
5203	Barrel Pin	5493	Stock, Service, left
5216	Mainspring Rod Swivel	5494	Stock, Service, right
5227	Center Pin Spring	5553	Trigger Stud (Model 42)
5231	Cylinder with Extractor and Pins	5553	Cylinder Stop Stud (Model 42)
5239	Extractor	5577	Rebound Slide Stud (Model 42)
5255	Extractor Rod	5580	Frame Lug (Model 42)
5260	Extractor Spring	5581	Hammer Stud (Model 42)
5277	Hammer Stud (Model 40)	5590	Barrel 2″ (Model 42)
5278	Cylinder Stop Stud (Model 40)	5594	Hand (Model 42)
5278	Rebound Slide Stud (Model 40)	5614	Thumbpiece
5278	Trigger Stud (Model 40)	5615	Bolt

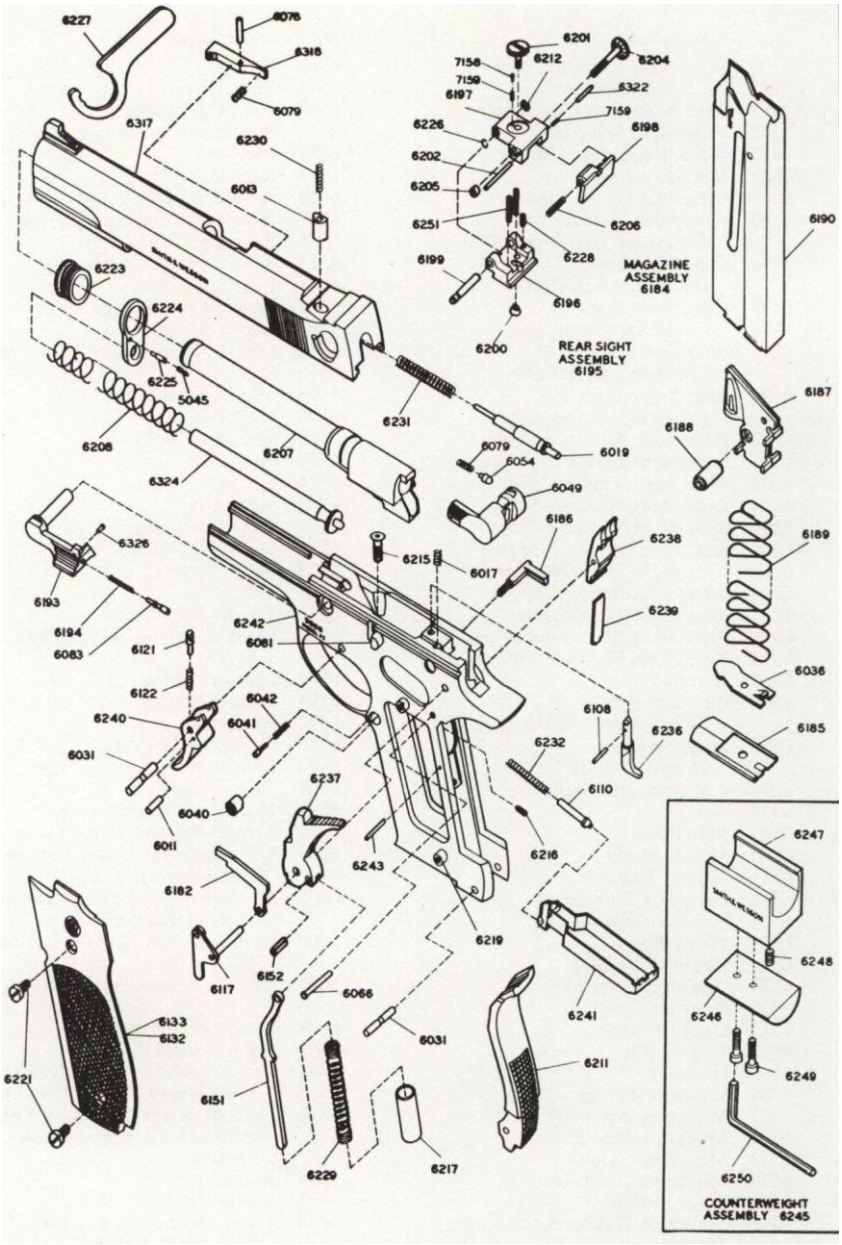
5280	Hammer Nose Bushing	5616	Rebound Slide
5281	Frame Lug (Model 40)	5729	Stock Pin (Model 42)
5292	Hammer Nose	5736	Side Plate (Model 42)
5293	Hammer Nose Rivet	5742	*Frame, with Studs, Bushing & Lug (Model 40)
5296	Hand with Stud (Model 40)		
5301	Hand Pin	5743	Frame with Studs (Model 42)
5302	Hand Torsion Spring	5748	Safety Lever (Model 42)
5303	Hand Torsion Spring Pin	5749	Mainspring
5303	Sear Pin	5924	Cylinder Stop
5303	Trigger Lever Pin	7062	Center Pin
5304	Hand Spring Pin		
5311	Plate Screw, Crowned		* (factory exchange only)



PARTS LIST-S&W MODEL 41 ·22 AUTOMATIC

Part No.	Description	Part No.	Description
5102	Rear Sight Elevation Nut	6548	Pawl
5105	Rear Sight Spring Clip	6549	Pawl Cam
5106	Rear Sight Elevation Stud	6550	Pawl Cam Plunger
5107	Rear Sight Windage Nut	6551	Pawl Cam Spring
6041	Magazine Catch Plunger	6552	Pawl Pin
6045	Mainspring	6553	Rear Sight
6069	Magazine Catch Spring	6554	Rear Sight Assembly
6195	Rear Sight Assembly	6555	Rear Sight Elevation Spring
	for Heavy Barrel only	6556	Rear Sight Pivot Clip
6196	Rear Sight Base	6557	Rear Sight Pivot Pin
	for Heavy Barrel only	6558	Rear Sight Slide
6197	Rear Sight Body	6561	Rear Sight Windage Screw
	for Heavy Barrel only	6563	Recoil Spring
6198	Rear Sight Slide	6564	Recoil Spring Guide
	for Heavy Barrel only	6565	Sear
6199	Rear Sight Pivot Pin	6566	Sear Spring
	for Heavy Barrel only	6568	Slide
6200	Rear Sight Elevation Nut	6570	Slide Stop & Ejector
6201	Rear Sight Elevation Screw	6572	Slide Stop Spring
6202	Rear Sight Traverse Pin	6574	Stirrup
6204	Rear Sight Windage Screw	6575	Stirrup Pin

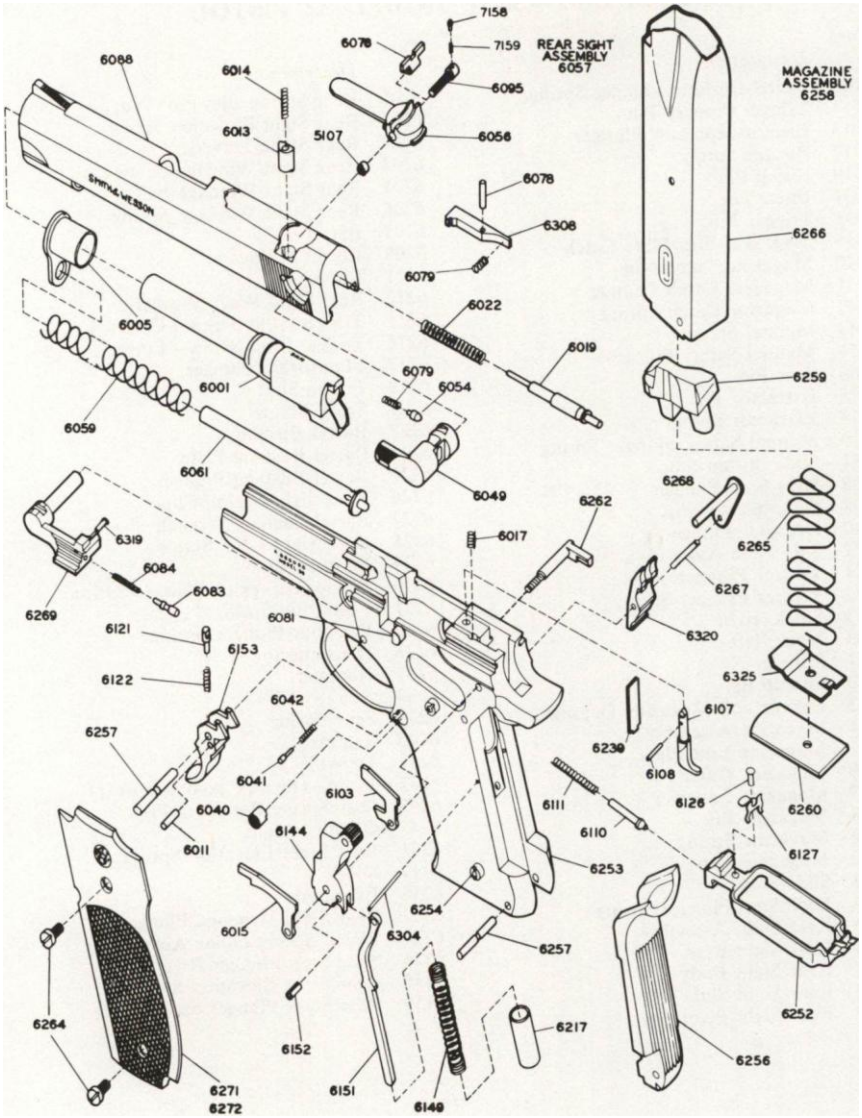
6205	Rear Sight Windage Nut	6576	Stock, Left-hand
6206	Rear Sight Windage Spring	6577	Stock, Right-hand
6212	Rear Sight Wavy Washer	6579	Stock Screw
6226	Rear Sight Spring Clip	6580	Trigger
6228	Rear Sight Lock Screw	6581	Trigger Stop Screw
6251	Rear Sight Elevation Spring	6586	Manual Safety Spring Plate
6322	Rear Sight Windage Plunger		Screw
6502	Barrel, 7⅜″	6589	Magazine Pin
6504	Barrel Weight	6591	Trigger Spring
	(Aluminum), ⅜ oz.	6592	Extractor
6505	Barrel Weight	6593	Trigger Bar Spring
	(Steel), 1¾ oz.	6595	Indicator
6506	Barrel Weight Short	6597	Trigger Bar
6508	Bolt	6598	Magazine Disconnector
6509	Bolt Pin	6602	Trigger Pull Adjusting Lever
6510	Muzzle Brake	6604	Counterweight Upper Section
6511	Muzzle Brake Screw		(Aluminum), 3 oz.
6513	Extractor Plunger	6605	Counterweight Upper Section
6514	Extractor Spring		(Steel), 7¼ oz.
6515	Firing Pin	6606	Counterweight Middle Section
6516	Firing Pin Spring		4¼ oz.
6520	Guard (Oversize)	6607	Counterweight Lower Section
6521	Guard		4 oz.
6522	Guard Pin	6608	Counterweight Nut
6522	Trigger Pin	6609	Counterweight Screw
6523	Hammer	6610	Counterweight Assembly With
6526	Indicator Spring		Steel Upper Section (6605)
6527	Magazine Assembly	6612	Counterweight Assembly With
6528	Magazine Butt Plate		Aluminum Upper Section
6529	Magazine Catch		(6604)
6530	Magazine Catch Nut	6629	Barrel, 5″
6531	False Muzzle	6642	Barrel, 5½″
6535	Magazine Disconnector Spring	6649	Front Sight Assembly for
6536	Magazine Follower		Ext. Front Sight
6537	Mainspring Retainer Pin	6650	Barrel for Ext. Front Sight, 5½″
6538	Magazine Spring	6651	Set Screw for Ext. Front Sight
6539	Magazine Spring Plunger	6658	Escutcheon
6540	Magazine Tube	6659	Escutcheon Nut
6542	Mainspring Retainer	6660	Frame (factory exchange only)
6543	Sear Pin	7158	Rear Sight Plunger
6545	Manual Safety	7159	Rear Sight Plunger Spring
6547	Manual Safety Spring Plate		



PARTS LIST- S&W MODEL 52 PISTOL

Part No.	Description	Part No.	Description
5045	Barrel Bushing Plunger Spring	6200	Rear Spring Elevation Nut
6011	Trigger Plunger Pin	6201	Rear Sight Elevation Screw
6013	Ejector-depressor Plunger	6202	Rear Sight Traverse Pin
6017	Ejector Spring	6204	Rear Sight Windage Screw
6019	Firing Pin	6205	Rear Sight Windage Nut
6031	Insert Pin	6206	Rear Sight Windage Spring
6031	Trigger Pin	6207	Barrel
6036	Magazine Butt Plate Catch	6208	Recoil Spring
6040	Magazine Catch Nut	6211	Insert
6041	Magazine Catch Plunger	6212	Rear Sight Wavy Washer
6042	Magazine Catch Spring	6215	Trigger Stop Screw—Upper
6049	Manual Safety	6216	Trigger Stop Screw—Lower
6054	Manual Safety Plunger	6217	Mainspring Plunger
6066	Sear Pin	6219	Frame Stud
6078	Extractor Pin	6221	Stock Screw
6079	Extractor Spring	6223	Barrel Bushing
6079	Manual Safety Plunger Spring	6224	Barrel Bushing Plate
6081	Slide Button Stop	6225	Barrel Bushing Plunger
6083	Slide Stop Plunger	6226	Rear Sight Spring Clip
6108	Disconnector Pin	6227	Barrel Bushing Wrench
6110	Drawbar Plunger	6228	Rear Sight Lock Screw
6117	Side Plate Assembly	6229	Mainspring
6121	Trigger Plunger	6230	Ejector-depressor Plunger Spring

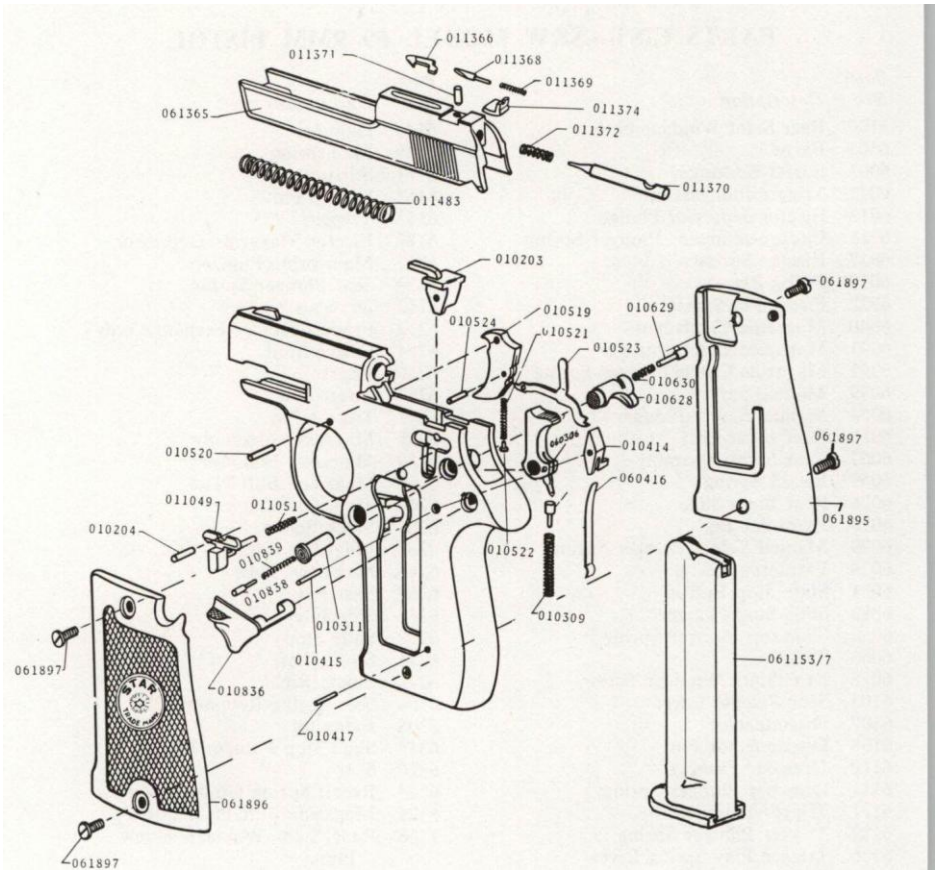
6122	Trigger Plunger Spring	6231	Firing Pin Spring
6132	Stock, right	6232	Drawbar Plunger Spring
6133	Stock, left	6236	Disconnector
6151	Stirrup	6237	Hammer
6152	Stirrup Pin	6238	Sear
6182	Ejector and Magazine Depressor	6239	Sear Spring
6184	Magazine Assembly	6240	Trigger
6185	Magazine Butt Plate	6241	Drawbar
6186	Magazine Catch	6242	Frame (factory exchange only)
6187	Magazine Follower	6243	Sear Spring Retaining Pin
6188	Magazine Pin	6245	Counterweight
6189	Magazine Spring	6251	Rear Sight Elevation Spring
6190	Magazine Tube	6317	Slide
6193	Slide Stop	6318	Extractor
6194	Slide Stop Plunger Spring	6322	Rear Sight Windage Plunger
6195	Rear Sight Assembly	6324	Recoil Spring Guide Assembly
6196	Rear Sight Base	6326	Slide Stop Plunger Rivet
6197	Rear Sight Body	7158	Rear Sight Elevation Spring
6198	Rear Sight Slide	7159	Rear Sight Plunger Spring
6199	Rear Sight Pivot Pin		



PARTS LIST-S&W MODEL 59 9MM PISTOL

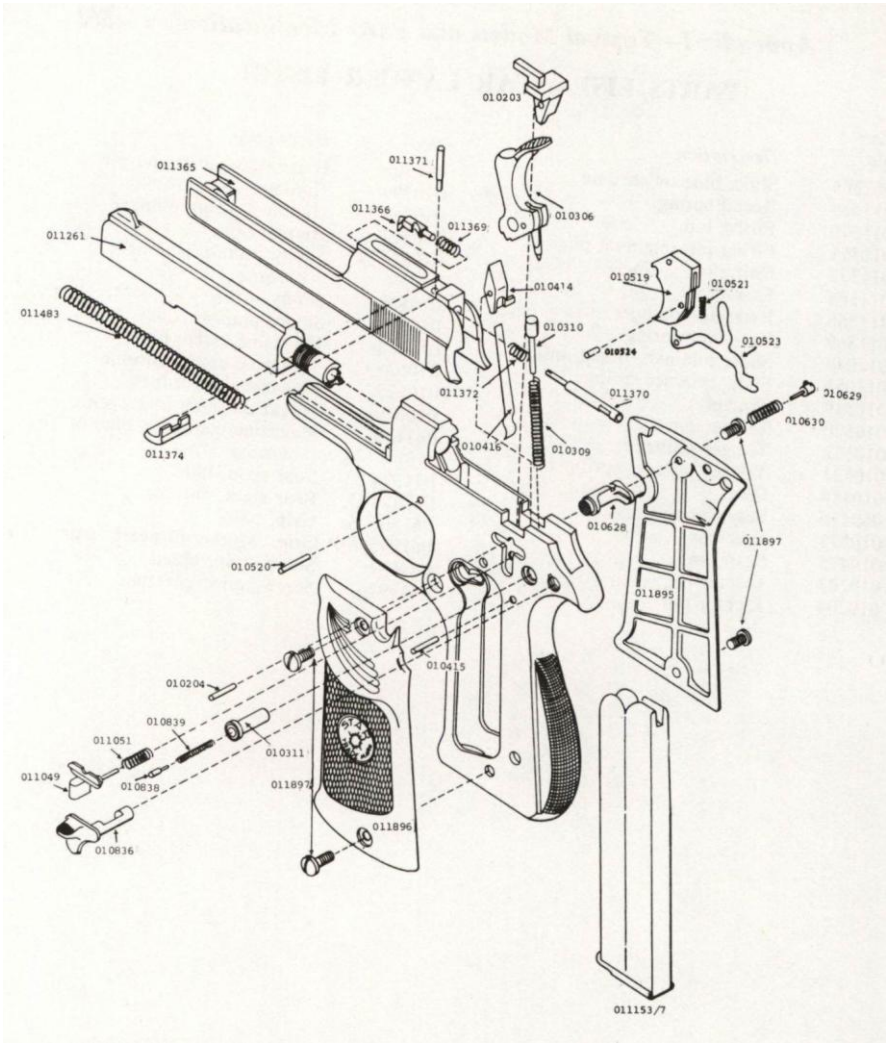
Part No.	Description	Part No.	Description
5107	Rear Sight Windage Nut	6144	Hammer
6001	Barrel	6149	Mainspring
6005	Barrel Bushing	6151	Stirrup
6011	Trigger Plunger Pin	6152	Stirrup Pin
6013	Ejector-depressor Plunger	6153	Trigger
6014	Ejector-depressor Plunger Spring	6182	Ejector Magazine Depressor
6017	Ejector Spring	6217	Mainspring Plunger
6019	Firing Pin	6239	Sear Plunger Spring
6022	Firing Pin Spring	6252	Drawbar
6040	Magazine Catch Nut	6253	Frame (factory exchange only)
6041	Magazine Catch Plunger	6254	Frame Stud
6042	Magazine Catch Plunger Spring	6256	Insert
6049	Manual Safety	6257	Insert Pin
6054	Manual Safety Plunger	6257	Trigger Pin
6056	Rear Sight Leaf	6258	Magazine Assembly
6057	Rear Sight Assembly	6259	Magazine Follower
6059	Recoil Spring	6260	Magazine Butt Plate
6076	Rear Sight Slide	6262	Magazine Catch
6078	Extractor Pin	6264	Stock Screw
6079	Manual Safety Plunger Spring	6265	Magazine Spring
6079	Extractor Spring	6266	Magazine Tube
6081	Slide Stop Button	6267	Sear Pin
6083	Slide Stop Plunger	6268	Sideplate
6084	Slide top Plunger Spring	6269	Slide Stop
6088	Slide	6271	Stock, Left
6095	Rear Sight Windage Screw	6272	Stock, Right

6103	Sear Release Lever	6304	Sear Spring Retaining Pin
6107	Disconnector	6308	Extractor
6108	Disconnector Pin	6319	Slide Stop Plunger Rivet
6110	Drawbar Plunger	6320	Sear
6111	Drawbar Plunger Spring	6323	Recoil Spring Guide Assembly
6121	Trigger Plunger	6325	Magazine Butt Plate Catch
6122	Trigger Plunger Spring	7158	Rear Sight Windage Screw
6126	Trigger Play Spring Rivet		Plunger
6127	Trigger Play Spring	7159	Rear Sight Windage Sc. Pig. Sprg.



PARTS LIST-STAR LANCER PISTOL

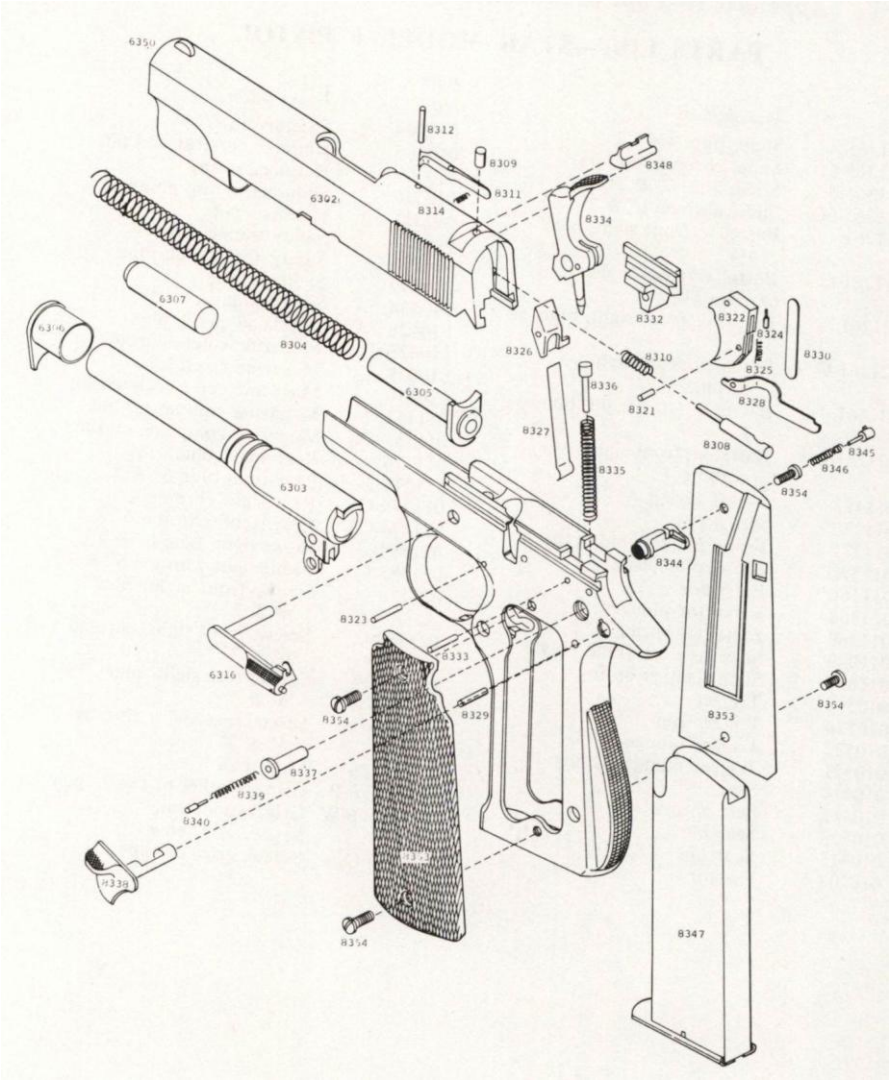
Part No.	Description	Part No.	Description
061365	Slide, blue or chrome	060306	Hammer w/strut and pin
011483	Recoil spring	010309	Hammer spring
011370	Firing Pin	010310	Hammer spring plunger
011371	Firing pin retaining pin	010311	Hammer pin
011372	Firing pin spring	010836	Safety thumb, blue or chrome
011366	Extractor		
011368	Extractor plunger	010839	Safety spring
011369	Extractor spring	010838	Safety plunger
011049	Slide, retainer (blued only)	010628	Magazine catch, blue
011051	Slide, retainer spring	010628-C	Magazine catch, chrome
010519	Trigger	010629	Magazine catch, lock
010520	Trigger pin	010630	Magazine catch lock spring
010522	Trigger plunger	061153/7	Magazine complete, blue or chrome
010521	Trigger plunger spring		
010414	Sear	011374	Rear sight, blue
060416	Sear Spring	011374-C	Rear sight, chrome
010523	Sear bar	061895/6	Grip, pair
010415	Sear pin	061895/6-P	Grip, Mother-of-pearl, pair
010203	Ejector	061897	Screw, grip, blued
010204	Ejector pin	061897-C	Screw, grip, chrome



PARTS LIST-STAR MODEL F PISTOL

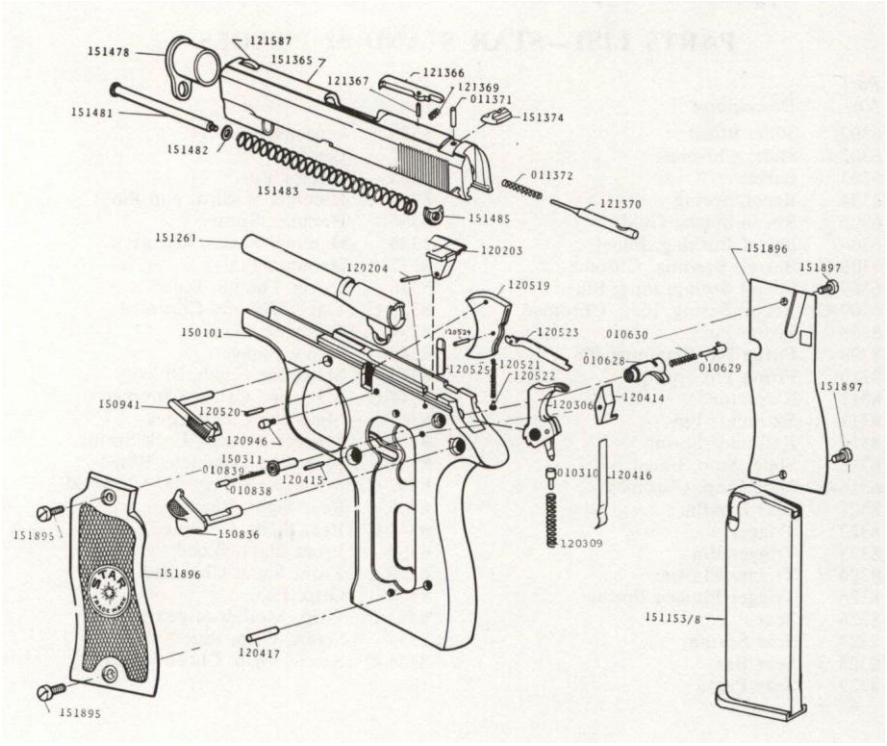
Part No.	Description	Part No.	Description
011365	Slide, blue 4¼″	010204	Ejector pin
011365-C	Slide, chrome 4¼″	010306	Hammer w/strut and pin
011365-6	Slide, blue 6″ & 7″	010309	Hammer spring
011365-6C	Slide, chrome 6″ & 7″	010310	Hammer spring plunger
011261	Barrel w/front sight, blue 4¼″	010311	Hammer pin
		010836	Safety thumb, blue
011261-C	Barrel w/front sight, chrome 4¼″	010836-C	Safety thumb, chrome
		010839	Safety spring
021261	Barrel w/front sight, blue 6″	010838	Safety plunger
		010628	Magazine catch, blue
021261-C	Barrel w/front sight, chrome 6″	010628-C	Magazine catch, chrome
		010629	Magazine catch lock
031261	Barrel w/front sight, blue 7″	010630	Magazine catch lock spring
		011153/7	Magazine complete, blue
031261-C	Barrel w/front sight, chrome 7″	011153/7C	Magazine complete, chrome
		011374	Rear sight, blue 4¼″
011483	Recoil spring	021374	Rear sight blue 6″ & 7″
011370	Firing pin	011374-C	Rear sight chrome 4¼″
911371	Firing pin retaining pin	021374-C	Rear sight, chrome 6″ & 7″
011372	Firing pin spring	021587	Front sight, blue 6″ & 7″
011366	Extractor	021587-C	Front sight, chrome 6″ & 7″
011368	Extractor plunger	021588	Screw, front sight, blue 6″ & 7″
011369	Extractor spring		
011049	Slide retainer (blue only)	021588-C	Screw, front sight, chrome 6″ & 7″
011051	Slide retainer spring		
010519	Trigger	021375	Screw, rear sight, blue 6″ & 7″
010520	Trigger pin		
010522	Trigger plunger	021375-C	Screw, rear sight, chrome 6″ & 7″
010521	Trigger plunger spring		

010414	Sear	011895/6	Grip, pair
010415	Sear spring	011895/6-P	Grip, Mother-of-pearl, pair
010523	Sear bar	011895/6-W	Grip, wood, pair
010415	Sear pin	011897	Screw, grip, blue
010203	Ejector	011897-C	Screw, grip, chrome



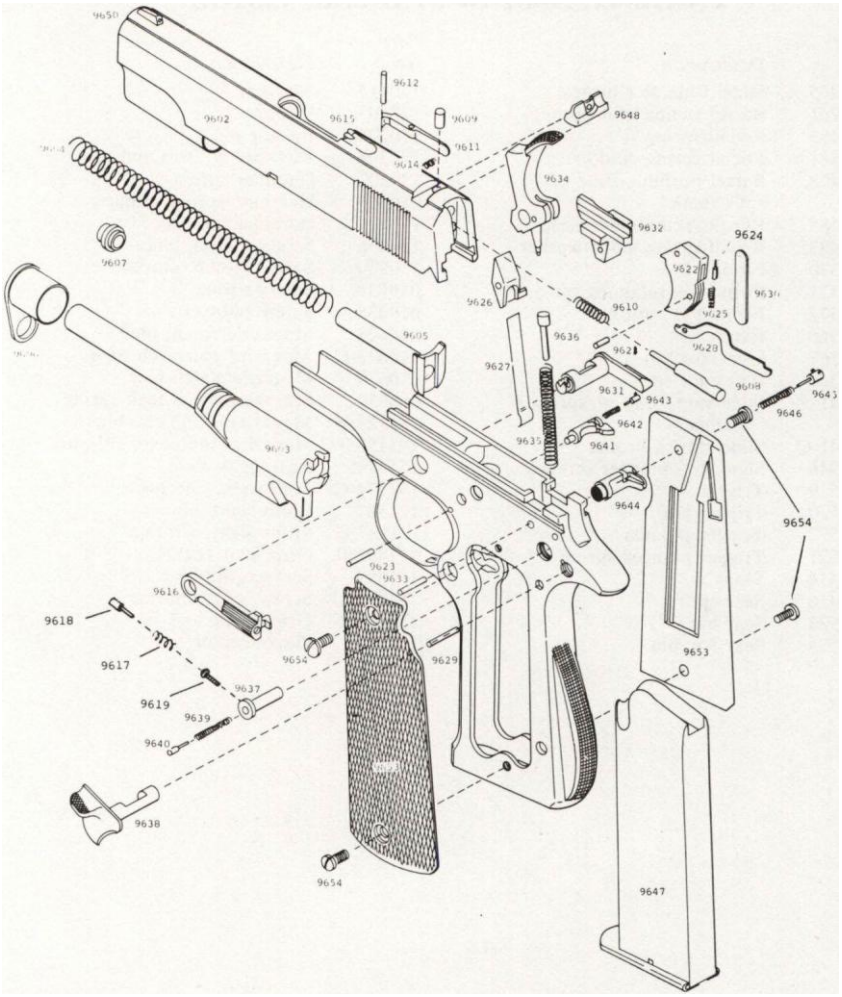
PARTS LIST-STAR S AND SI PISTOLS

Part No.	Description	Part No.	Description
6302	Slide, Blued	8330	Disconnector
6302-C	Slide, Chrome	8332	Ejector
6303	Barrel	8333	Ejector Pin
8304	Recoil Spring	8334	Hammer w/Strut and Pin
6305	Recoil Spring Guide	8335	Hammer Spring
6306	Barrel Bushing, Blued	8336	Hammer Spring Plunger
6306-C	Barrel, Bushing, Chrome	8337	Hammer Pin
6307	Recoil Spring, Plug, Blued	8338	Safety Thumb, Blued
6307-C	Recoil Spring, Plug, Chromed	8338-C	Safety Thumb, Chromed
8308	Firing Pin	8339	Safety Spring
8309	Firing Pin Retaining Pin	8340	Safety Plunger
8310	Firing Pin Spring	8344	Magazine Catch, Blued
8311	Extractor	8344-C	Magazine Catch, Chromed
8312	Extractor Pin	8345	Magazine Catch Lock
8314	Extractor Spring	8346	Magazine Catch Lock Spring
6316	Slide, Stop, Blued	8347	Magazine Complete, Blued
6316-C	Slide Stop, Chromed	8347-C	Magazine Complete, Chromed
8321	Sear Bar Pin	8348	Rear Sight, Blued
8322	Trigger	8348-C	Rear Sight, Chromed
8323	Trigger Pin	6350	Front Sight, Blued
8324	Trigger Plunger	6350-C	Front Sight, Chromed
8325	Trigger Plunger Spring	8353	Grip, Pair
8326	Sear	8353-P	Grip, Mother-of-pearl, Pair
8327	Sear Spring	8354	Screw, Grip, Blued
8328	Sear Bar	8354-C	Screw, Grip, Chromed
8329	Sear Pin		



PARTS LIST-STAR STARFIRE PISTOL

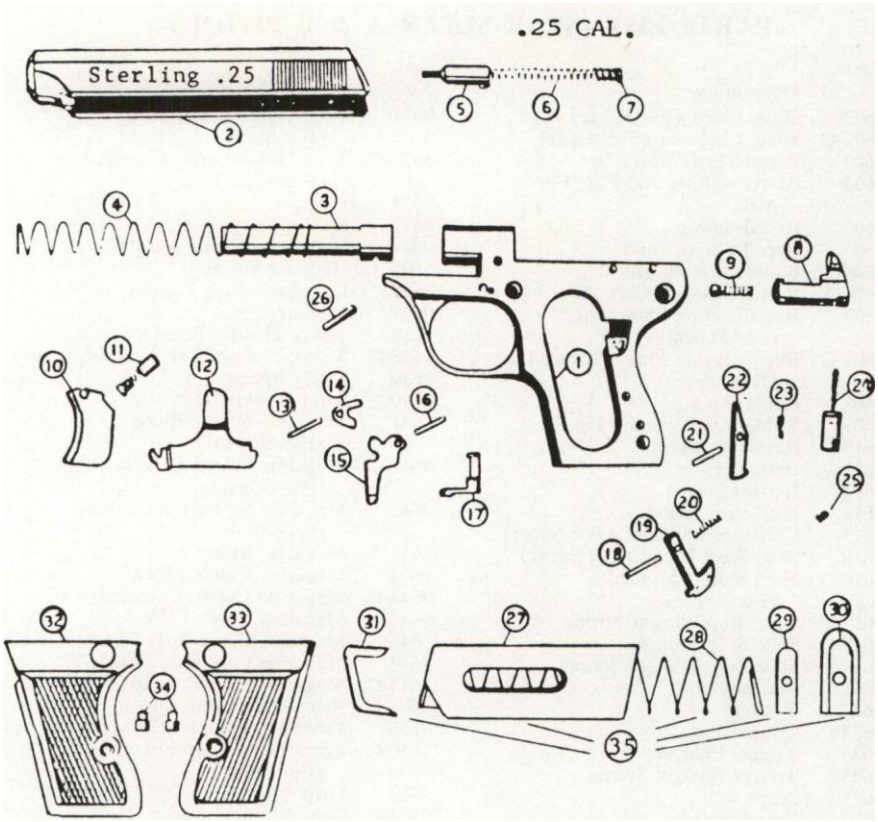
Part No.	Description	Part No.	Description
151365	Slide, Blue or Chrome	120415	Sear pin
151261	Barrel w/link and pin	120203	Ejector
151483	Recoil spring	120204	Ejector pin
151481	Recoil spring guide	120306	Hammer w/strut and pin
151478	Barrel bushing, Blue or	120309	Hammer spring
	Chrome	010310	Hammer spring plunger
151485	Recoil spring guide head	150311	Hammer pin
151482	Recoil spring guide washer	150836	Safety thumb, blue
121370	Firing pin	150830	Safety thumb, chrome
011371	Firing pin retaining pin	010839	Safety spring
011372	Firing pin spring	010838	Safety plunger
121366	Extractor	010628	Magazine catch, blue
121367	Extractor pin	010628-C	Magazine catch, chrome
121369	Extractor spring	010629	Magazine catch lock
15041	Slide stop, blue, w/spring &	010630	Magazine catch lock spring
	plunger	151153/8	Magazine complete, blue
15041-C	Slide stop, Chrome	151153/8C	Magazine complete, chrome
120946	Slide stop plunger screw	151374	Rear sight, blue
120519	Trigger	151374-C	Rear sight, chrome
120520	Trigger pin	121587	Front sight, blue
120522	Trigger plunger	121587-C	Front sight, chrome
120521	Trigger plunger spring	151895-P	Grip, pair (pearl)
120414	Sear	151897	Screw, grip, blue
120416	Sear spring	151897-C	Screw, grip, chrome
120523	Sear bar	151895/6	Grips, Pair
120524	Sear bar pin	120525	Disconnector



PARTS LIST—STAR SUPER A & B PISTOLS

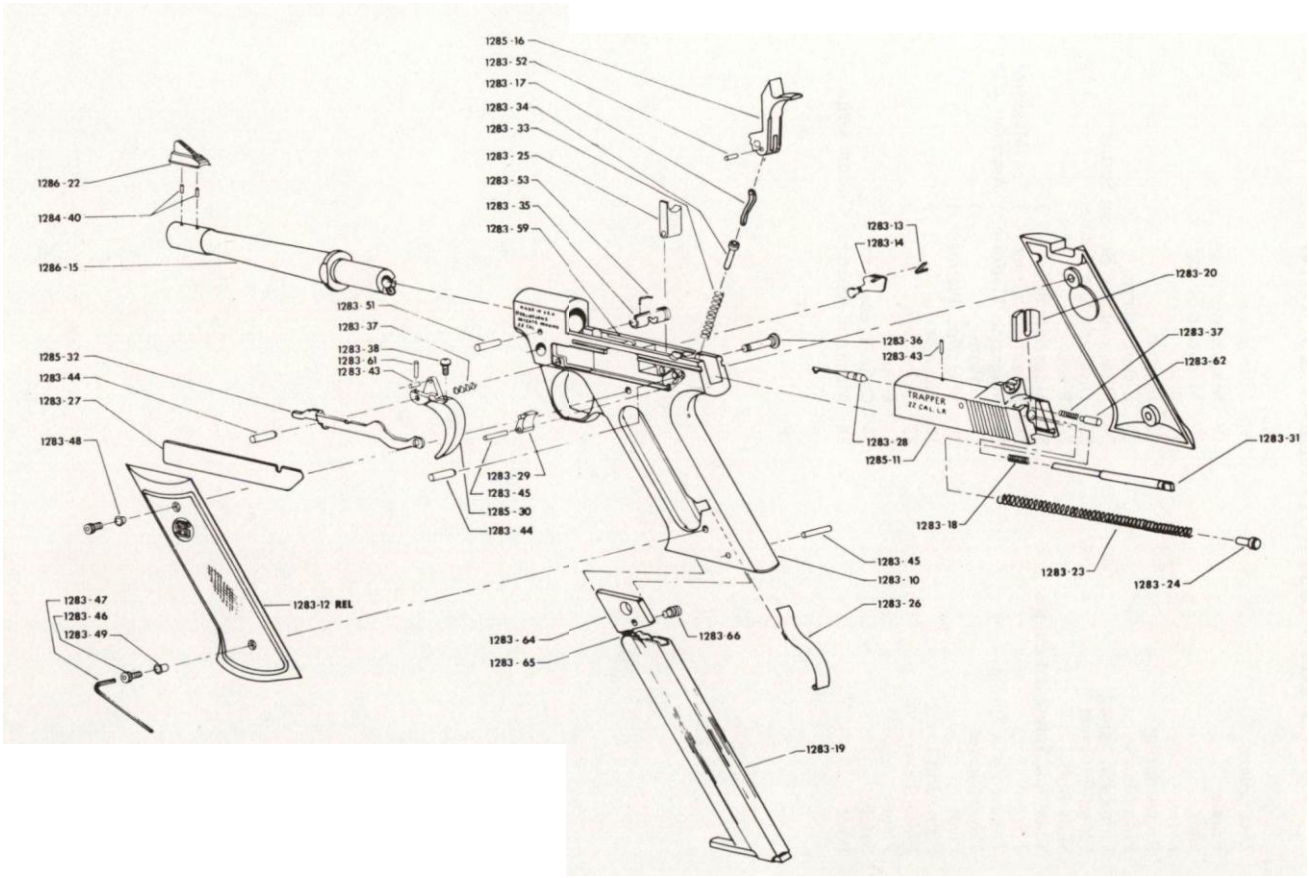
Part No.	Description	Part No.	Description
9602	Slide, Blued (For Super)	9631	Take Down Lever, Blued (For Super)
9602-C	Slide, Chromed (For Super)		
9603	Barrel (For Super)	9631-C	Take Down Lever, Chromed (For Super)
9603	Barrel w/Link and Pin (For A-B)	9632	Ejector
9604	Recoil Spring	9633	Ejector Pin
9605	Recoil Spring Guide	9634	Hammer w/Strut and Pin
9606	Barrel Bushing, Blued	9635	Hammer Spring
9606-C	Barrel Bushing, Chromed	9636	Hammer Spring Plunger
9607	Recoil Spring Plug, Blued (For Super)	9637	Hammer Pin
		9638	Safety Thumb, Blued
9607-C	Recoil Spring Plug, Chromed (For Super)	9638-C	Safety Thumb, Chromed
		9639	Safety Spring
9608	Firing Pin	9640	Safety Plunger
9609	Firing Pin Retaining Pin	9641	Magazine Safety, Blued (For Super)
9610	Firing Pin Spring		
9611	Extractor	9641-C	Magazine Safety, Chromed (For Super)
9612	Extractor Pin		
9614	Extractor Spring	9642	Magazine Safety Lock Spring (Super)
9615	Cartridge Indicator (For Super)		
9616	Slide Stop, Blued (For Super)	9643	Magazine Safety Lock
9616-C	Slide Stop, Chromed (For Super)	9644	Magazine Catch, Blued
		9644-C	Magazine Catch, Chromed
9617	Slide Stop Plunger Spring	9645	Magazine Catch Lock
9618	Slide Stop Plunger	9646	Magazine Catch Lock Spring
9619	Slide Stop Plunger Screw	9647	Magazine Complete, Blued
9621	Sear bar pin	9647-C	Magazine Complete, Chromed
9622	Trigger	9648-C	Rear Sight, Chromed
9623	Trigger Pin	9650	Front Sight, Blued (For Super)
9624	Trigger Plunger	9650-C	Front Sight, Chromed (For Super)
9625	Trigger Plunger Spring		

9626	Sear	9653	Grip, Pair
9627	Sear Spring	9653-P	Grip, Mother-of-pearl, Pair
9628	Sear Bar	9654	Screw Grip, Blued
9629	Sear Pin	9654-C	Screw, Grip, Chromed
9630	Disconnector		



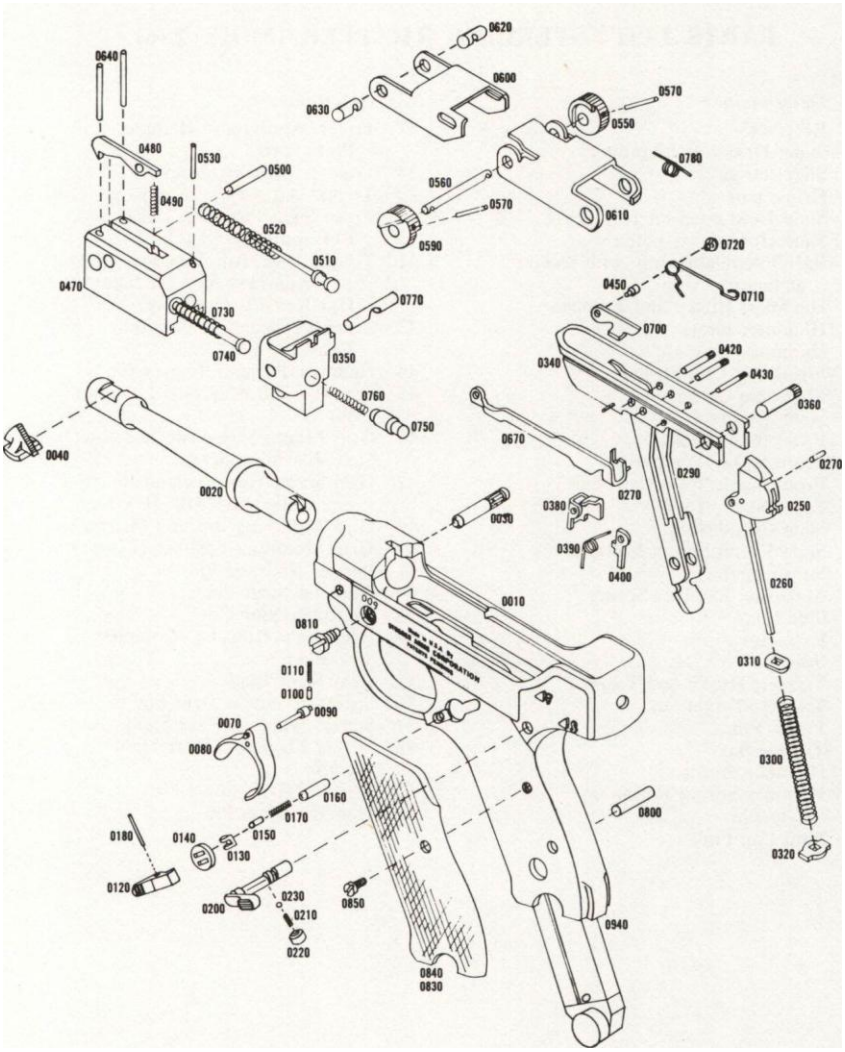
PARTS LIST-STERLING ·25 AUTO

Part No.	Description	Part No.	Description
1	Frame	19	Magazine
2	Slide	20	Magazine Spring
3	Barrel	21	Pivot
4	Recoil Spring	22	Ejector
5	Firing Pin	23	Ejector Spring
6	Firing Pin Spring	24	Disassembling Bottom Spring
7	Firing Pin Pivot	25	Disassembling Bottom
8	Slide Bolt	26	Pivot
9	Slide Bolt Spring & Follower	27	Magazine Box)
10	Trigger	28	Magazine Spring) See Magazine
11	Trigger Pivot Spring	29	Magazine Platform) Assembly #35
12	Trigger Lever		Plate)
13	Pivot	30	Magazine Platform)
14	Firing Pin Lever	31	Elevator)
15	Firing Lever	32	Grips)
16	Pivot	33	Grips
17	Safety	34	Grip Screws
18	Pivot	35	Magazine Assembly Custom Grips



PARTS LIST—STERLING TRAPPER (MOD. 286)

Part No.	Description	Part No.	Description
10	Receiver	37	Trigger Spring and Hammer Plate Spring
11	Slide; Husky and Trapper		
11	Slide; target	38	Trigger Fwd. adj. Screw
12	Grips; pair	39	Trigger Aft Adj. Screw; Target Only
13	Slide Hold open latch spring	40	Front Sight Pins (2); Luger Style Bbls. only
14	Slide Hold Open Latch		
15	Barrel Available only with receiver at factory	41	Trigger Fwd. Adj. Hex Key; trigger Aft. Adj. Hex Key windage Adj.
16	Hammer; Husky and Trapper		Hex Key (Target Only)
16	Hammer; target	43	Trigger Disconnect Pin and Extractor Pin
17	Hammer Strut		
18	Firing Pin Coil Spring	44	Hammer Pin and Trigger Pin
19	Magazine Complete	45	Sear Pin and Magazine Locating Pin
20	Hammer Plate		
22	Front Sight; Husky	46	Grip Mount Screw (4) and Rear Sight Elevation Screw
22	Front Sight; Trapper		
22	Front Sight; T300	47	Grip Screw Hex Key and Rear Sight Elevation Adj. Hex Key
22	Front Sight; T300L		
23	Slide Recoil Spring	48	Grip Mounting Bushing (Upper)
24	Slide Recoil Spring Follower	49	Grip Mounting Bushing (Lower)
25	Stop Lug	51	Banner Receiver Pin
26	Magazine Retainer Spring	52	Hammer Strut Pin
27	Side Plate	53	Safety Friction Pin
28	Extractor	54	Rear Sight Housing (Complete w/Blade)
29	Sear		
30	Trigger; Husky and Trapper	55	Rear Sight Blade
	Trigger; Target	56	Spring, Windage Rear Sight
31	Firing Pin	57	Screw, Windage Rear Sight
32	Trigger Bar	58	Spring Elevation, Rear Sight
33	Hammer Spring	59	Ejector
34	Hammer Spring Follower	61	Trigger Bar Support Pin
35	Safety Pin	62	Hammer Plate Pin
36	Stop Lug Pin		



PARTS LIST-STOEGER ·22 LUGER PISTOL

Part No.	Description	Part No.	Description
0010	Frame	0470	Bolt
0020	Barrel	0480	Extractor
0030	Barrel Pin	0490	Extractor Spring
0040	Front Sight	0500	Extractor Pin
0080	Trigger	0510	Firing Pin
0070	Roll Pin	0520	Firing Pin Spring
0090	Trigger Pin	0530	Roll Pin
0100	Plunger	0550	Toggle Grip RH
0110	Trigger Pin Plunger Spring	0560	Toggle Link Pin
0120	Magazine Catch	0570	Roll Pin
0130	Magazine Catch Anchor	0590	Toggle Grip LH
0140	Magazine Catch Anchor Plate	0600	Front Toggle
0150	Magazine Catch Plunger	0610	Rear Toggle
0160	Magazine Catch Plunger Guide	0620	Front Toggle Pin RH
0170	Magazine Catch Spring	0630	Front Toggle Pin LH
0180	Magazine Catch Pin	0640	Roll Pin
0190	Safety Lever (Right Side)	0570	Roll Pin
0200	Safety Lever (Left Side)	0670	Sear Bar
0210	Safety Spring	0270	Roll Pin
0220	Safety Spring Housing	0700	Bolt Stop
0230	Safety Detent Ball	0710	Bolt Stop Spring
0250	Hammer	0720	Bolt Stop Spring Retainer
0260	Hammer Strut	0730	Drive Spring
0270	Roll Pin	0740	Drive Spring Guide
0290	Magazine Guide	0750	Takedown Plunger
0300	Hammer Spring	0760	Takedown Plunger Spring
0310	Hammer Spring Washer	0770	Rear Toggle Pivot Pin
0320	Hammer Strut Anchor Plate	0780	Rear Toggle Spring

0340	Boltways	0800	Main Frame Pin
0350	Boltways Block	0810	Sear Bar Retaining Screw
0360	Swaged Pin	0830	Grip RH Checkered Pressed Wood
0380	Sear	0840	Grip LH Checkered Pressed Wood
0390	Sear Spring		Grip RH Plain Walnut
0400	Safety Shoe		Grip LH Plain Walnut
0420	Swaged Pin	0850	Grip Screw (2)
0430	Swaged Pin	0900	Roll Pin
0450	Bolt Stop Pin	0940	Complete Magazine Assembly

Appendix II

PUBLISHER'S NOTE: The firms and addresses listed in Appendices II and III are complete and accurate to the best of our knowledge, however some may have gone out of business or have moved since this book was published.

GUNSMITHING SUPPLIES, TOOLS AND SERVICES

Listed here are the names and addresses of a good many sources of gunsmithing goods, services, handgun accessories, supplies, tools, etc., however, if it's parts you need, check the suppliers in Appendix III.

AMMUNITION (COMMERCIAL)

Browning Arms Co., Route #1, Morgan, Utah 84050
Cascade Cartridge, Inc., Box 660, Lewiston, Ida. 83501 (rimfire)
Federal Cartridge Co., 2700 Foshay Tower, Minneapolis, Minn. 54402
Hornady Manufacturing Co., Box 1848, Grand Island, Nebraska 68801
Micro Shooter's, Box 213, Las Cruces, N. M. 88001
Norma-Precision, South Lansing, New York 14882
Peters Cartridge Div., Bridgeport, Conn. 06602
Remington Arms Co., Bridgeport, Conn. 06602
S&W, Inc., 3640 Seminary Rd., Alton, 111. 62004 (handgun only)
Speer Bullets, P. O. Box 641, Lewiston, Idaho 83501
Super Vel Cartridge Corp., Box 40, Shelbyville, Ind. 46176 (handgun)
Three-D Company, Doniphan, Nebraska 68832 (handgun only)
Winchester-Western Cartridge Co., East Alton, 111. 62024

AMMUNITION (CUSTOM)

Andy's Reloading Service, Box 115, Wilmot, Wis. 53192
Blackhawk Small Arms Ammo, 616 Kingsley Dr., Rockford, 111. 61111
Russell Campbell, 219 Leisure Dr., San Antonio, Tex. 78201
Drumm's Handloads, 410 Belden Ave., San Antonia, Tex. 78214
Ellwood Epps, 80 King St., Clinton, Ont., Canada
J&J Ammo, Box 2202, Memphis, Tenn. 38102 (Match ammo only)
Maryland Reloading Service, 6835 Beaver Dam Rd., Beltsville, MD. 20705
Merrill Reloading Service, Box 249, Libertyville, 111. 60048
Moody's Reloading Service, 2108 Broadway, Helena, Mont. 59601
Robert Pomeroy, 45 Wyoming, Waterbury, Conn. 56706
Reloading Service, Midland Ave., Washington, N. J. 07882
Shooter's Service & Dewey, Inc., Clinton Corners, N. Y. 12514
George Spence, Steele, Missouri 63877

AMMUNITION (FOREIGN)

Abercrombie & Fitch, Madison at 45th St., New York, New York 10017
Canadian Ind., Ltd. (C. I. L.) Box 10, Montreal, Que. Canada
Centennial Arms Corp., 3318 W. Devon, Chicago, 111. 60645
Dynamit-Nobel (RWS, DWM), P. O. Box 140, 5 Koelh-Weldenpesch, West Germany
Hudson, 52 Warren, New York, N. Y. 1007
Marshall Hyde, Inc., Port Huron, Michigan 48060
Imperial Chemical Ind., 448 Madison Ave., N. Y., N. Y. 10022
Interarms Limited, 10 Prince St., Alexandria, Virginia 22313
Norma-Precision, South Lansing, N. Y. 14882
Oregon Ammo Service, Box 19341, Portland, Ore. 97219
Service Armament, 689 Bergen Blvd., Ridgefield, N. J. 07657

Stoeger Arms Corp, 55 Ruta Ct., So. Hackensack, N. J. 07606 (RWS)

CLEANING AND REFINISHING SUPPLIES

Brownell's Incorporated, 303 E. Main, Montezuma, Iowa 50171
Clenzoil Co., Box 1226, Sta. C., Canton, O. 44708
Forty-Five Ranch Enterpr., Box 1080, Miami, Okla. 74354
Gun-All Products, Box 244, Dowagiac, Mich. 49407
Frank C. Hoppe, 2310 N. 8th St., Philadelphia, PA. 19133
Jet-Aer Corp., 165 3rd St., Paterson, N. J. 07514 (blues and oils)
Lehigh Chem. Co., Box 5197, Chestertown, MD. 21620 (Anderol)
Mint Luster Cleaners, 602 W. Atlantic St., Appleton, Wis. 54912
Frank Mittermeier, 3577 East Tremont Ave., N. Y., N. Y. 10465
Outers Laboratories, Onalaska, Wis. 54650 (Gunslick Kits)
Stoeger Arms Corp., 55 Ruta Court, S. Hackensack, N. J. 07606 (RWS) (glues, oils)
WD-40 Company, 5390 Napa St., San Diego, CA. 92110

CUSTOM PISTOLSMITHS

Alamo Heat Treating, Box 10502, Houston, Texas 77018
C&F Trading Co., Inc. Route 1, Box 430A, Hyattstown, MD. 20734 (conversions)
Chicago Gun Center, 3109 W. Armitage, Chicago, 111. 60647
Christy Gun Works, 875 57th St., Sacramento, CA. 95831
F. Bob Chow, Gun Shop, 3185 Mission, San Francisco, CA. 94110 (accurizing)
Custom Gunshop, 33 Herning Ave., Cranford, N. J., 07016 (conversion)
J. E. Clark, 7424 Broadacres Rd., Shreveport, LA. 71109 (accurizing)
Alton S. Dinan, Jr., P. O. Box 674, Canaan, Conn. 06018 (accurizing)
DyBro Products, 5 W. Webster, Marshalltown, IA. 50158
George Elliason, 2109 Carroll Place, Tampa, Fla. 33618
Giles' 45 Shop, Rt. 1, Box 41A, Odessa, Fla. 33556 (accurizing)
Gil Hebard Guns, Box 1, Knoxville, 111. 61448
Ward Koozer, Box 18, Walterville, Ore. 97489 (reboring)
Larry S. Krause, 5628 Winchester, Chicago, 111. 60635
Harold E. MacFarland, 741 Cooper Basin Rd., Prescott, Ariz. 86301
Mag-Na-Port Arms, 16746 14-Mile Rd., Fraser, MI. 48026 (conversions)
Rudy Marent, 1 First Ave., Apt. 1, Daly City, CA. 94104
Modern Gun Craft, 18 Charles St., E. Norwalk, Conn. 06855
Pachmayr Gun Works, 1220 S. Grand Ave., Los Angeles, CA. 90015 (accurizing)
George Pearsall, 514 N. State, Chicago, 111. 60610
Schumaker's Gun Shop, 208 W. 5th Ave., Colville, Wash. 99114
Larry Seecamp, 561 Whitney Ave., New Haven, Conn. 06511 (DA. 45 Conversion)
George Sheldon (Silver Dollar Gun Shop), 10 Frances St., Box 489, Franklin, N. H. 03235 (conversion)
R. L. Shockey, 1614 S. Choctaw, El Reno, Okla., 73036 (accurizing)
Shooters Service & Dewey Inc., Clinton Corners, N. Y., 13514
Snapp's Gunshop, 214 N. Washington, Royal Oak, Mich. 48065 (relining)
Armand D. Swenson, 3223 West 145 St., Gardena, CA. 90249 (conversion)
"300" Gun Shop, 4655 Washington St., Denver, Colorado, 80216 (DA conversion)
J. W. VanPatten, Box 145, Forrest Hill, Milford, PA. 18337 (reboring)
David Woodruff, 116 Stahl Ave., Wilmington Manor, New Castle, Delaware 19720 (relining)
Wyatt's Custom Gunshop, Kosciusko, Miss. 39090

GUNSMITH SUPPLIES, TOOLS, SERVICES

American Edelstaal, Inc., 1 Atwood Ave., Tenafly, N. J., 07670 (Unimat)
Atlas Arms, Inc., 2704 N. Central, Chicago, 111. 60639 (handtools)
B-Square Co., Box 11281, Ft. Worth, Tex. 76110 (jigs)
Bob Brownell's, Main & Third, Montezuma, IA. 50171 (everything)
Clymer Grinding Co., 14241 W. 11 Mile Rd., Oak Park, Mich. 48237 (reamers)
Dremel Mfg. Co., 2420 18th St., Racine, Wis. 53401 (grinders)
F. K. Elliott, Box 785, Ramona, CA. 92056 (reamers)
Forster Appelt Mfg. Co. Inc., 82 E. Lanark Ave., Lanark, 111. 61046 (gauges)
Keith Francis, Box 343, Talent, Ore. 07540 (reamers)
Grace Metal Prod., Box 67, Elk Rapids, Mich. 49629 (screwdrivers)
H & M, 24062 Orchard Lake Rds., Farmington, Mich. 48024 (reamers)
Frank Mittermeier, 3577 E. Tremont, N. Y., N. Y. 10465 (everything)

Palmgren, 8383 South Chicago Ave., Chicago, 111. 60167 (vises, etc.)
Redford Reamer Co., Box 6604, Detroit, Mich. 48240 (reamers)
Rockwell, Delta Power Tools, 400 N. Lexington Ave., Pittsburgh, Pa. 15208
Sears Roebuck & Co., 925 S. Homan Ave., Chicago, III. 60607 (power and hand tools)
Twin City Steel Treating Co., Inc. 1114 S. 3rd St., Minneapolis, Minn. 55145
Wilson Arms Co., Box 364, Stony Creek, Branford, Conn., 06408

HANDGUN ACCESSORIES

A & R Sales, South El Monte, CA. 91733
Bar-Sto-Precision Machine, 633 South Victory Blvd., Burbank, CA. 91502
B. L. Broadway, 1715 Darnell Way, San Diego, CA. 92105
Case Master, 1852 N. W. 36th Miami, Fla. 33142
Central Specialties Co., 3813 N. Harlem, Chicago, 111. 60631
Custom Gunshop, 33 Herning Ave., Cranford, N. J. 07016
John Dangelzer, 3056 Frontier Pi. N. E., Albuquerque, N. M. (flasks)
R. S. Frielech, 396 Broome St., N. Y., N. Y., 10013 (cases)
Joe F. Frye, Box 2202, Memphis, Tenn. 38102
Hunt Eng, 264 Coronado, Long Beach, CA. 90803 (Multi-Loader)
R. G. Jensen, 8923 Sepulveda Blvd, Sepulveda, CA. 91343 (auxiliary chamber)
Pachmayr, 1220 S. Grand, Los Angelos, CA. 90015 (cases)
Potomac Arms, Box 35, 200 Strand St., Alexandria, VA. 22314
C. A. Raville, Caraville Arms, 650 Moorpark Rd., Thousand Oaks, CA. 91360
Sportsmen's Equipment Co., 415 W. Washington, San Diego, CA. 92103
Armand D. Swenson, 3223 West 145th St., Gardena, CA. 90249
Triple K. Manufacturing Co., 568 Sixth Ave., San Diego, CA. 92101
M. Tyler, 1324 W. Britton, Oklahoma City, Okla. 73114 (grip adaptor)

HANDGUN STOCKS

Fitz, Box 49797, Los Angeles, CA. 90049
Herret's, Box 741, Twin Falls, Ida. 83301
Marty Lihl, 760 Ravenhill PI., Ridgefield, N. J. 07657
Mershon Co. Inc., 1230 S. Grand Ave., Los Angeles, CA. 90015
Mustang Grips, Box 449, Corona, CA. 91720
Safety Grip Corp., Box 456, Riverside Sta., Miami, Fla. 33135
Sanderson Custom Pistol Stocks, 17695 Fenton, Detroit, Mich. 42819
Jay Scott, 91 Sherman PL, Garfield, N. J. 07026

LOAD TESTING & CHRONOGRAPHING

Custom Ballistics Lab., 3354 Cumberland Dr., San Angelo, Tex. 76092
Jurras Co., Shelbyville, Ind. 46176
Kennon's, 5408 Biffle, Stone Mountain, GA. 30083
R & M Chronograph Serv., 9882 E. Manning, Selma, CA. 93662
Shooters Service & Dewey, Inc., Clinton Corners, N. Y. 12514
Shooting Assoc. Inc., Stanfordville, N. Y. 12581
White Laboratories, Bel Aire, MD. 21014

MISCELLANEOUS

Bore Collimator, Alley Supply Co., Box 458, Sonora, CA. 95370
Bore Lamp, Spacetron, Inc., Box 84, Broadview, 111. 60155
Borescope, Eder Inst. Co., 2293 N. Clybourn, Chicago, 111. 60614
Color Hardening, L. D. Machamer, 1903 Sherman, Coeur d'Alene, Ida. 83814
Dry Firing Aid, Pitman Industries, Box 325, Pitman, N. J. 08071
Handgun Cartridge Holder, Arma, Inc., 300 High St., Hartford, Conn. 06103
Nipple Wrenches, Chopie Tool & Die, Co., 531 Copeland Ave., La Crosse, Wis. 54601
Trigger Shoe, Pacific Gun Sight Co., Box 4495, Lincoln, Neb. 68504
Trigger Shoe, Melvin Tyler, 1324 W. Britton, Oklahoma City, Okla. 73114

RELOADING TOOLS AND ACCESSORIES

Ashurst Die Co., Box 60377, Riverton Hts., Seattle, Wash. 98188
Bonanza Sports, Inc., RT 4, Faribault, Minn. 55021 (scale)
C-H Die Co., Box 431, Gardena, CA. 90247
Division Lead Co., 7742 W. 61st Place, Summitt, 111. 60502
Flambeau Plastics, 801 Lynn, Baraboo, Wis., 53913
Forster-Appelt Mfg. Co. Inc., 82 E. Lanark Ave., Lanark, 111. 61046
Frank A. Hemsted, Box 381, Sunland, CA. 91040
Hensley & Gibbs, Box 10, Murphy, Ore. 97533
Herter's Inc., RR 1, Waseca, Minn. 56903
Lachmiller Eng., 6445 San Fernando Rd., Glendale, CA. 91211
Lee Engineering, Rt. 2, Hartford, Wis. 53027
Lyman Gun Sight Corp., Middlefield, Conn. 06455
Potter Eng. Co., 1410 Santa Ana Dr., Dunedin, Fla. 33528
RCBS, Inc., Box 1919, Oroville, CA. 95965
Redco, Box 15523, Salt Lake City, Utah 84115
Redding-Hunter, 114 Stair Rd., Cortland, N. Y. 13045 (lead wire)
SAECO, P. O. Box 778, Carpinteria, CA. 93013
Texan Reloaders, Inc., P. O. Box 5355, Dallas, Tex. 75222

SIGHTS

Bo-Mar Tool & Mfg. Co., 59800 North Ave., New Haven, Mich. 48048
Christy Gun Works, 875 57th St. Sacramento, CA. 95831
George Elliason, 2109 Carroll PI., Tampa, Fla. 33618
Firearms Dev., Lab., Box 42, Watsonville, CA. 95088
Micro Sight Co., 242 Harbor Blvd., Belmont, CA. 94002
Original Sight Exchange Co., Box J., Paoli, PA. 19301

Appendix III

HANDGUN PARTS, ANTIQUE AND OBSOLETE

Christy Gun Works, 875 57th St., Sacramento, CA. 95831
Dixie Gun Works, Inc., Reel Foot Ave., Union City, Tenn. 38261
Philip R. Crouthamel, 817 E. Baltimore, E. Lansdowne, PA. 19050
Greeley Arms Co. Inc., 448 Pompton, Cedar Grove, N. J. 07009
Hudson Sporting Goods Co., 52 Warren St., New York, N. Y. 10007
Numrich Arms Co., West Hurley, N. Y. 12491
Ozzies Gun Parts, Box C 274, Mineral, 111. 61344
Martin Retting, 11029 Washington Blvd., Culver City, CA. 90230
Sarco, Inc., 192 Central, Stirling, N. J. 07980
N. F. Strebe, 4926 Marlboro Pike S. E., Washington, D. C. 20027
Tilden Mfg. Co., 607 Santa Fe Dr., Denver, Colo. 80204
C. S. Weisz, Box 311, Arlington, VA. 22210 (antique)

HANDGUN PARTS (MODERN)

Bob's Gun Shop, P. O. Box 2332, Hot Springs, Ark. 71901 (foreign)
Custom Gunshop, 33 Herning Ave., Cranford, N. J. 07016
Numrich Arms Co., West Hurley, N. Y. 12491
Martin Retting, 11029 Washington Blvd., Culver City, CA. 92030
Sarco, Inc., 192 Central, Stirling, N. J. 07980
Stoeger Industries, 55 Ruta Court, South Hackensack, N. J. 07606
Armand Swenson, 3223 West 145th St., Gardena, CA. 90249

Appendix IV - WORTHWHILE REFERENCE BOOKS

(By title, author and publisher or source)

Black Powder Guide; Nonte, Stoeger
The Book of Colt Firearms; Sutherland & Wilson, Sutherland
Book of Pistols & Revolvers; Smith, Stackpole
Colt Automatic Pistols; Bady, Fadco
Encyclopedia of Firearms; Nonte, Outdoor Life
Firearms Bluing & Browning; Angier, Stackpole
Firearms Design & Ballistics; Whelen, Samworth*
Firearms Identification; Mathews, Thomas
Gun Digest Exploded Views; Digest Books
Gunsmithing Simplified; MacFarland, Barnes
Gunsmithing The Single Action Colt; Smith, Riling
Gunsmith Kinks; Brownell's
Hobby Gunsmithing; Walker, Digest Books
Home Gunsmithing Digest; Bish, Digest Books
Introduction to Modern Gunsmithing; MacFarlan, Stackpole
Mauser, Walther, & Mannlicher Firearms, Smith, Stackpole
Military Small Arms of the 20th Century; Hogg & Weeks, Digest Books
The Modern Gunsmith; Howe, Funk & Wagnalls
NRA Handgun Assembly; National Rifle Association
Pistols, a Modern Encyclopedia; Stebbins, Stackpole
Sixguns by Keith; Keith, Stackpole
Small Arms of the World; Smith & Smith, Stackpole
Smith & Wesson, 1857-1945; Neal & Jenks, Bames
Stoeger Gun Parts Catalog; Stoeger Industries

A few of the above references will be found in local bookstores, but nearly all can be obtained by mail from Ray Riling Arms Book Company, 6844 Gorsten Street, Philadelphia, Pa. 19119, or Rutgers Book Center, 127 Raritan Avenue, Highland Park, New Jersey. Asterisks indicate title out of print by publisher, but check the mentioned firms, both of which specialize in arms references.

Appendix V - PISTOLSMITHING GLOSSARY

A common failing among gun enthusiasts is not knowing the proper names and nomenclature for parts and functions. Here is a basic list of terms and definitions. They are best used by referring to the nomenclature drawings so that part shape and function can be seen clearly.

ACCURIZE Careful hand fitting and modification to produce maximum accuracy.

RACK STRAP The rear portion of that part of a handgun frame to which the stocks are attached.

RACK THRUST The load exerted rearward on the breech face when a cartridge is fired. May be calculated by multiplying chamber pressure by case head area.

BARREL BUSHING A support in the slide muzzle of an auto pistol for the barrel; may be fixed (Browning) or removable (Colt).

BARREL CAM Cam surfaces in the barrel or frame which serve to lock and unlock the breech.

BARREL/CYLINDER GAP The space between barrel and cylinder of a revolver, essential to smooth operation. Normally about. 006 inch.

BARREL EXTENSION In a short-recoil autoloader a tubular member attached to the rear of the barrel, containing the breech bolt, and movable upon the frame. Not common but found in Parabellum, Mauser M96, and Auto Mag pistols.

BARREL LINK The short pivoted bar which raises and lowers the barrel to lock in Colt/Browning type autoloader designs.

BARREL LUG A protrusion on the barrel for attachment of accessories or to house other parts.

BARREL TANG (HOOD) A projection at the upper rear of an auto pistol barrel which controls relative longitudinal positions of barrel and slide when in battery. Also aids feeding.

BARREL TRAVEL The distance traveled by the barrel in locking and unlocking in a recoil-operated auto pistol.

BELLY GUN A small, compact revolver or auto intended to be carried concealed.

BOLT (cylinder stop) A movable stud protruding through a revolver frame into a notch in the cylinder to hold said cylinder in alignment with barrel.

BOSS A protrusion on a part, to house other parts or to maintain alignment with related parts.

BREECH FACE That portion of a revolver frame or autoloader slide which supports the cartridge head upon firing.

CALIBER Bore or groove diameter expressed (in English) in decimals of an inch, otherwise in the metric system. Frequently compounded to indicate powder capacity of cartridge case; to show date of adoption; to show case length or to show proprietor, etc. E. G.. 357 S&W Magnum,. 22 Rem. Jet,. 38-40 Winchester, etc.

CAP GROOVE In a percussion revolver, clearance cuts in the recoil shield to allow easy application of caps and to provide clearance for fired caps.

CAPLOCK Used on a muzzle-loading gun whose ignition system employs a percussion cap, a small metal cup containing a detonating mixture. This cup, placed on a "nipple," transmits flame to the powder charge when struck by the gun's hammer.

CHAMBER That part of the bore, (or cylinder, in a revolver) at the breech, formed to accept the cartridge.

CHAMBER INDICATOR A pin, button, or lever which is forced outward when a cartridge is chambered in an autoloader to indicate the gun is fully loaded. May be a separate part or a design function of the extractor.

CLICK The increment of adjustment in adjustable sights. Provided by a spring or ball detent engaging notches in the adjustment screw. Of no established value, though normally producing less than a 1 inch change at 50 yards, dependent upon manufacturer. Usually both audible and tactile.

CLIP See "Magazine."

COMBAT CONVERSION A shortened and lightened handgun intended purely for law enforcement use.

COMBAT GUARD A trigger guard reshaped at the front to provide a secure seat for the off-hand forefinger in two-hand shooting.

COMBAT SIGHT A very general term referring to adjustable target- type sights of lowest profile and minimum bulk.

CONVERSION UNIT Parts to be assembled to an existing gun to change its caliber or configuration, i.e., Colt. 22 Conversion Unit for . 45 caliber Government Model.

CRANE (yoke) In a solid-frame, side-swing revolver, that part which is pivoted to the frame, (receiver) and carries the cylinder.

CRIMP The bending inward of the case mouth perimeter, in order to grip and hold the bullet, or to keep the shot in a paper case intact.

CROWN The radiused, recessed portion of a barrel muzzle which protects the edge of the bore from impact damage.

CYLINDER In a revolver, a cartridge container that rotates (generally) around an axis parallel to and below the barrel and contains several parallel cartridge chambers.

CYLINDER LATCH A part, usually actuated by one's thumb, to disengage the cylinder of a revolver so the arm may be opened for loading and unloading and extraction of fired cases.

CYLINDER STOP See "Bolt."

DEHORN To cut off the hammer spur and other nonessential projections from a revolver or auto to facilitate rapid handling.

DISCONNECTOR (interrupter) A device in an autoloader to prevent more than one shot being fired by a single trigger pull. Usually functions by breaking connection between trigger and sear as breech opens, and reconnecting when breech closes fully.

DOUBLE-ACE Trade name for an unusual device which allows cocking the Colt Government Model pistol by squeezing a lever at the rear of the grip. Manufactured by Caraville Arms.

DOUBLE ACTION The capability of cocking and firing from the uncocked position by trigger movement alone.

EJECTOR The device(s) at the barrel breech or within the action that forcibly expels the fired case from the gun. See "Extractor."

EJECTOR ROD A rod protruding under the barrel of a revolver which is pressed rearward to extract and eject cases from the cylinder.

END PLAY In a revolver, undesirable fore and aft motion of the cylinder.

EROSION More or less gradual wearing away of rifling by powder combustion gas, heat and bullet friction.

ESCUTCHEON A metal or plastic insert in grips to provide a more secure seat for screws. Sometimes applied to trade-mark emblems inletted into grips.

EXTRACTOR Device that removes or partially removes the fired cart ridge case from the chamber. See "Ejector."

FEED LIPS The upper edges of a magazine which position and guide cartridge during feeding from magazine to chamber.

FEED RAMP That portion of the barrel and/or frame which guides cartridges from magazine to chamber.

FIRING PIN A part of the action, actuated by a spring or separate hammer which strikes the primer and fires the cartridge.

FIRING-PIN BLOCK A mechanical stop or interlock which prevents a firing pin from reaching the primers until it is disengaged by linkage with the sear, hammer, or trigger at the instant of firing. In the Walther design it is a vertical plunger engaging the firing pin and displaced by the sear at hammer release.

FIRING-PIN BUSHING A hardened steel bushing let into the breech face of revolver or auto and containing the firing-pin hole. Usually also functions to limit firing-pin protrusion.

FIRING-PIN STOP A device for retaining a firing pin in an auto pistol while allowing easy tool-less removal of same.

FLINTLOCK Identifies a muzzle-loading gun fired by means of a piece of flint, held in the hammer or cock jaws, striking against a steel frizzen. Incandescent particles of steel scraped from the frizzen fall into a pan holding powder. This ignited powder flames through the touch- hole, thus firing the main charge.

FLUTE In a revolver the semi-circular lightening channels cut between chambers in the outer surface of the cylinder. May also be any long lightening cut elsewhere.

FLY A spring-loaded leg attached to (generally) a revolver hammer. Allows hammer to be raised and dropped by a single pull of the trigger in double-action.

FOLLOWER A platform in a magazine that pushes the cartridges upward at the proper angle for feeding into the chamber.

FORCING CONE The funneled area at the rear of a revolver barrel where bullets pass into it from the cylinder.

FRAME LUG On a revolver a protrusion which engages the rear of the cylinder when open to keep it properly aligned for subsequent closing.

GRID ADAPTOR A curved block fitting between revolver trigger guard and butt as a filler to allow a better hold.

GRIP SAFETY A manual safety located on the grip or stocks which must be depressed before the gun can be fired.

HALF JACKET A type of handgun bullet in which a thin, soft, copper alloy jacket covers only the surface in contact with the bore.

HAMMER A part of the action activated (in some guns) by the trigger. The hammer drives the firing pin against the primer, thus igniting the cartridge powder charge.

HAMMER BLOCK A device which interrupts hammer travel to prevent the firing pin from being struck unless the trigger is deliberately pulled.

HAMMERLESS In an auto, a straight-line, striker-type firing mechanism which does not contain a pivoted hammer. In a revolver and a few autos, a design which merely encloses or conceals a pivoted hammer.

HAND That finger-like part attached to hammer or trigger that rotates the cylinder of a revolver when the arm is cocked.

INERTIA FIRING PIN In an auto pistol a firing pin shorter than the recess which contains it, and dependent upon its own momentum for igniting the primer.

JUMP Upward movement of the muzzle, due to recoil, which occurs before the bullet leaves the barrel.

LEADING The accumulation of lead-alloy bullet metal in a barrel which is rubbed from the bullet by excessive heat and friction and adheres to the bore. Usually due to too-soft alloy, inadequate lubrication, or rough bore surface.

LOADING GATE A pivoted part which when swung outward exposes the chamber(s) of a solid frame revolver's cylinder for loading.

LOADING LEVER In a percussion revolver the pivoted lever under the barrel by which balls or bullets are forcefully seated in the chambers.

MAGAZINE Device or reservoir to hold extra cartridges, of many types and names. "Clip," once reserved for the metal strip from which cartridges are fed into a magazine well, now refers to separate, detachable magazines also, as with those for self-loading pistols.

MAGAZINE CATCH (release) The device which retains the magazine in an auto pistol and which is actuated to release the magazine for removal.

MAGAZINE EJECTOR A spring device only rarely encountered which ejects the magazine forcibly from an auto pistol when the magazine catch is actuated.

MAGAZINE LOADER A device for mechanically depressing the follower and spring to facilitate placing cartridges in the magazine. Important in use of large-capacity magazines equipped with heavy springs.

MAGAZINE SAFETY A mechanical interlock which prevents firing when the magazine is removed from an auto pistol.

MAINSPRING The spring driving the hammer or striker or firing pin to provide energy for primer ignition.

MATCHLOCK An early form of firearm in which the priming charge was ignited by a cord or "match" of slow-burning material.

MUZZLE BRAKE A device attached to or machined into a barrel muzzle that deflects gas outward and rearward through slots to reduce recoil and jump.

NIGHT SIGHT Any sight or sights modified to increase visibility in poor light. May be bright colored, fluorescent, luminous, radioactive, electrically lighted, etc.

NIPPLE On muzzle-loading arms, the small metal cone at the rear of the barrel (or cylinder) through which the flame from the percussion cap passes to ignite the powder charge.

PATRIDGE SIGHT Current standard form of handgun sight with rectangular front element and rear notch as viewed by shooter.

PEENING A method of moving metal by hammering it lightly, causing it to flow laterally away from the hammer blow; done cold and comparable to forging except in degree.

PERCUSSION CAP Small metallic cup containing fulminating material that explodes when struck by gun's hammer. See "Nipple."

PISTOL Reputedly derived from Pistoia, an early gunmaking center in Italy. Any small, concealable, short-barreled hand weapon, generally not a revolver. Refers today to any autoloading or single-shot handgun.

QUICK-LOADER A device for carrying revolver cartridges in a group of 5 or 6, properly held for simultaneous insertion into a revolver cylinder.

RATCHET A notched ring centered in the rear of a revolver cylinder and engaged by the hand (part name) to rotate the cylinder and align individual chambers with the barrel in sequence.

REBOUNDING FIRING PIN A firing pin fitted with a separate retracting spring which automatically withdraws it inside the breech after firing.

REBOUNDING HAMMER A hammer which is automatically moved slightly rearward after firing by springs or cams. Present in all modern DA revolvers, except those utilizing a transfer bar.

REBOUND SLIDE (lever) A part of a revolver action which withdraws the hammer slightly after the firing pin has struck the primer.

RECOIL BUFFER A device installed in an auto pistol to reduce impact of slide coming to rest at end of recoil stroke.

RECOIL LENGTH The distance traveled by the slide of an auto pistol.

RECOIL SHIELD That portion of a revolver frame which supports the heads of the cartridges to prevent their moving out of the cylinder.

RECOIL SPRING In an auto pistol the spring(s) compressed during recoil to provide energy for closing the breech and feeding cartridges.

RECOIL SPRING GUIDE A rod or tube inside the recoil spring to prevent its kinking or rubbing on other surfaces.

REINFORCE An enlargement of a barrel at muzzle or breech for added strength as found on Mauser and Parabellum pistols.

ROUND BUTT A revolver with grip and grip frame rounded to minimum dimensions for ease of concealment. Many standard models are offered in both square and round butt, the latter usually in combination with short, light barrels.

SAFETY LEVER (block) In modern revolvers a part that moves to prevent the hammer from going fully forward unless the trigger is deliberately pulled fully to the rear.

SHORT ACTION A revolver action in which hammer travel has been reduced to the minimum.

SHORT RECOIL An auto pistol malfunction in which the breech does not open fully and thus fails to eject or feed, sometimes also fails to extract or cock. In a design, a locked-breech system in which slide and barrel recoil a short distance together, then unlock and the barrel halts, but the slide continues rearward.

SIDE PLATE A plate closely fitted into the side of a handgun frame, removable for access to the lockwork; found generally only in modern DA revolvers.

SINGLE ACTION Cocking the hammer manually before firing by trigger movement.

SLIDE STOP That part of an autoloader which engages the slide to hold it rearward. May be manually operated, or activated by the follower when the last round has been fired—or both, which is the most common form.

SMOKESTACK (Stovepipe) In an auto a form of malfunction in which the fired case is not ejected but is caught vertically, mouth up, between slide and barrel breech.

SNUBNOSE A revolver with 2″ or shorter barrel, usually of small size.

SPITTING In a revolver, the throwing off of bullet material to one or both sides as a consequence of poor cylinder/barrel alignment.

STIRRUP A short link connecting the hammer and mainspring of a revolver.

STRAIN SCREW In a revolver a screw used to vary mainspring compression.

STRESS RAISER Any irregularity, recess, or sharp corner in a part which causes concentration of stress under load. Can greatly increase probability of parts failure, even under normal load.

STUD A pin or axle threaded or swaged into a frame to support other parts, i.e., hammer or trigger stud.

SUPER VEL Trade name of Super Vel Cartridge Corp, developer of modern, high performance handgun ammunition.

SWAGE Forming metal cold under pressure in a die, as when a bullet is formed and assembled in a press, or when an oversize bullet is squeezed down upon entering a barrel.

TAKEDOWN LEVER (latch) In auto pistols a part which is actuated to disconnect slide, barrel, and frame to permit disassembly. May be separate as in the Walther P38 or a function of slide stop or other part as in Colt/Browning designs.

TARGET HAMMER A hammer with wider than normal spur, deeply checkered, and shaped especially for rapid and easy manual cocking.

TARGET TRIGGER A trigger with fingerpiece wider than normal to provide more positive control and to give a lighter feel.

THROAT In a revolver that portion of the chambers ahead of the cartridge case; in an autoloader that portion ahead of the chamber leading the bullet into the rifling.

THROAT, CYLINDER That portion of a revolver chamber through which the bullet must pass before entering the barrel.

THUMB REST A curved ledge in the grip or stock to aid in positioning the shooting thumb.

TOP STRAP The top portion of a revolver frame passing over the cylinder.

TRANSFER LEVER In modern revolvers a bar struck by the hammer and driven against the firing pin to fire the cartridge. Arranged so the bar is withdrawn except at the instant of firing and thus prevents hammer/firing pin contact at any other time.

TRIGGER SHOE An accessory attached to a trigger to provide a wider or longer finger engagement surface.

TRIGGER STOP A device for halting trigger movement the instant the hammer or striker is released. Prevents trigger over-travel.

UNDERLUG On S&W revolvers an integral protrusion of the barrel which houses the forward portion of the cylinder locking mechanism. On Colt revolvers it merely houses the ejector rod.

WHEELLOCK Refers to a muzzle-loading gun fired by means of a piece of flint or pyrites, held in the hammer jaws, which is held over a serrated steel wheel. This wheel, set in motion by a tensioned spring, protrudes through the bottom of the pan (wherein powder has been placed) and bears against the flint. Sparks are created, as in the flintlock, and the gun is fired by a flame passing through the touch-hole.

WRAPAROUND GRIPS Grips or stocks which cover front strap and/or back strap and meet along its centerline.

Appendix VI - HANDGUN CARTRIDGE REFERENCE TABLES

Ballistics for Standard Pistol and Revolver Center-fire Ammunition Produced by the Major U. S. Manufacturers

	Bullet				
Cartridge	Grs.	Style	Muzzle Velocity	Muzzle Energy	Barrel Inches
22 Jet	40	SP	2100	390	8⅜
221 Fireball	50	SP	2650	780	10½
25 (6·35mm) Auto	50	MC	810	73	2
256 Winchester Magnum	60	HP	2350	735	8½
30 (7·65mm) Luger Auto	93	MC	1220	307	4½
30 (7·63mm) Mauser Auto	85	MC	1410	375	5½
32 S&W Blank	No bullet		—	—	—
32 S&W Blank, BP	No bullet		—	—	—
32 Short Colt	80	Lead	745	100	4
32 Long Colt, IL	82	Lub.	755	104	4
32 Colt New Police	100	Lead	680	100	4
32 (7·65mm) Auto	71	MC	960	145	4
32 (7·65mm) Auto Pistol	77	MC	900	162	4
32 S&W	88	Lead	680	90	3
32 S&W Long	98	Lead	705	115	4
7. 5 Nagant	104	Lead	722	120	4½
32-20 Winchester	100	Lead	1030	271	6
32-20 Winchester	100	SP	1030	271	6
357 Magnum	158	SP	1550	845	8⅜
357 Magnum	158	MP	1410	695	8⅜
357 Magnum	158	Lead	1410	696	8⅜
357 Magnum	158	JSP	1450	735	8⅜
9mm Luger	116	MC	1165	349	4
9mm Luger Auto	124	MC	1120	345	4
38 S&W Blank	No bullet		—	—	—
38 Smith & Wesson	146	Lead	685	150	4
38 S&W	146	Lead	730	172	4
380 MK II	180	MC	620	153	5
38 Special Blank	No bullet		—	—	—
38 Special, IL	150	Lub.	1060	375	6
38 Special, IL	150	MC	1060	375	6
38 Special	158	Lead	855	256	6
38 Special	200	Lead	730	236	6
38 Special	158	MP	855	256	6
38 Special	125	SJHP	Not available		
38 Special	158	SJHP	Not available		
38 Special WC	148	Lead	770	195	6
38 Special Match, IL	148	Lead	770	195	6
38 Special Match, IL	158	Lead	855	256	6
38 Special Hi-Speed	158	Lead	1090	425	6
38 Special	158	RN	900	320	6
38 Colt New Police	150	Lead	680	154	4
38 Short Colt	128	Lead	730	150	6
38 Short Colt, Greased	130	Lub.	730	155	6
38 Long Colt	150	Lead	730	175	6
38 Super Auto	130	MC	1280	475	5
38 Auto, for Colt 38 Super	130	MC	1280	475	5
38 Auto	130	MC	1040	312	4½
380 Auto	95	MC	955	192	3¾
38-40 Winchester	180	SP	975	380	5
41 Long Colt, IL	200	Lub.	730	230	6
41 Remington Magnum	210	Lead	1050	515	8¾
41 Remington Magnum	210	SP	1500	1050	8¾
44 S&W Special	246	Lead	755	311	6½
44 Remington Magnum	240	SP	1470	1150	6½
44 Remington Magnum	240	Lead	1470	1150	6½

Cartridge	Bullet		Muzzle Velocity	Muzzle Energy	Barrel Inches
	Grs.	Style			
44-40 Winchester	200	SP	975	420	7½
45 Colt	250	Lead	860	410	5½
45 Colt, IL	255	Lub., L	860	410	5½
45 Auto	230	MC	850	369	5
45 ACP	230	JHP	850	370	5
45 Auto WC	185	MC	775	245	5
45 Auto MC	230	MC	850	369	5
45 Auto Match	185	MC	775	247	5
45 Auto Match, IL	210	Lead	710	235	5
45 Auto Rim	230	Lead	810	335	5½

IL-Inside Lubricated; JSP-Jacketed Soft Point; WC-Wadcutter; RH-Round Nose; HP-Hollow Point; Lub-Lubricated; MC-Metal Case; SP-Soft Point; MP-Metal Point; LGC-Lead Gas Check; JHP-Jacketed Hollow Point.

Appendix VII - TROUBLE SHOOTING TABLE

The malfunctions, probable causes, and corrective actions listed here are common to most guns within each type listed. Some models may not require exactly the same corrective actions advised, or may suffer different causes for some malfunctions; it would be impossible to list all combinations for all guns. But these common problems and solutions will cover most that will be encountered, and will serve as a guide for determining what must be done in instances not described here.

AUTOLOADERS

Malfunction	Probable Causes	Corrective Action
Misfire	Broken or bent firing pin	Replace
(shallow or no dent in primer)	Weak mainspring	Replace
	Excess headspace	Replace barrel
Slamfire	Defective cartridge (protruding primer)	Check ammunition
(cartridge fires as slide closes)	Firing pin jammed forward	Clean out hole, replace pin
Malfunction	Probable Causes	Corrective Action
Fails to extract	Broken extractor	Replace
	Rough or pitted chamber	Polish chamber or replace barrel
	Short recoil	Check ammunition
Fails to eject	Broken or missing ejector	Check for slide interference Replace
	Short recoil	Check ammunition
		Check for slide interference
Fails to feed	Bent or worn feed lips	Replace or repair magazine
	Rough feed ramp	Polish smooth
(Bullet nose jams on ramp)	Uneven ramp joint	Polish smooth
(Cartridge jams nose- up)	Bent feed lips	Replace magazine
(Slide rides over cartridge)	Magazine not fully seated	Reseat magazine
Slide doesn't stay open after last shot	Slide stop or notch in slide worn or broken	Replace
	Follower bent	Repair or replace
Magazine falls out	Worn or broken magazine catch	Replace
	Worn catch notch in magazine	Repair or replace
Hammer won't cock	Broken sear or broken sear spring	Replace
	Broken hammer notch	Replace
Hammer follows slide down and/or gun doubles	Too little sear engagement or wrong sear angle	Replace sear and hammer
Hammer drops from safety notch when trigger is pulled	Broken safety notch	Replace hammer
Fires with slide retracted more than 1/8-inch	Broken or worn disconnector	Replace
Malfunction	Probable Causes	Corrective Action
Hammer won't fall when trigger is pulled	Broken sear bar	Replace
	Trigger jammed	Inspect and clear
	Disconnector jammed	Inspect and clear
	Sear jammed	Inspect and clear
	Foreign material in action	Clean
Hammer falls when safety is engaged (if not hammer-dropping safety)	Safety worn or broken Safety spring broken	Replace Replace
Hammer does not fall when hammer- dropping safety is engaged	Trip lever worn or broken	Replace

Malfunction	Probable Causes	Corrective Action
Hammer falls but is caught by safety notch when trigger is pulled	Sear, sear bar, trigger linkage worn	Replace
Slide won't go fully forward	Bulged or too-long cartridge Excess dirt between barrel and slide Barrel not correctly fitted	Clear and inspect ammunition Clean Replace or refit
Trigger does not return forward after firing	Broken trigger spring	Replace
Magazine won't accept full number of cartridges	Dented body	Straighten or replace
Slide refuses to move thru full travel but is loose on frame	Broken or bent recoil spring or guide	Replace
Slide stop engages before last round is fired	Slide stop spring too weak Stop lip is being lifted by cartridges in magazine	Replace or tighten Cut lip back
Malfunction	Probable Causes	Corrective Action
Safety disengages while gun is being carried	Safety spring or detent loose or weak	Replace
Cartridge jams only half way into chamber, but properly aligned	Excessively dirty chamber Piece of cartridge case mouth stuck in chamber	Clean and polish Remove and polish chamber
Cartridge chambers and slide goes into battery but extractor won't engage rim	Oversize case rim Dirt under extractor Bent extractor Excess headspace	Check ammunition Strip and clean Repair or replace Replace barrel
Fired case extracts but is rechambered	Short recoil Light load	Check for slide interference Check ammunition
Extractor pulls through case rim	Very rough or dirty chamber	Clean and polish
Slide jams rearward	Bent recoil spring guide or battered abutment in frame Bent or loose ejector	Repair guide, clean off burrs. Repair or replace
Slide jams forward	Bent or broken recoil spring guide Improperly fitted barrel Bent barrel bushing	Repair or replace Refit or replace Replace
Slide stop moves out during firing and jams slide	Stop retaining lips worn off	Replace stop
Gun won't fire when drawn from holster because slide is out of battery	Recoil spring too weak or too short	Replace
Gun feeds ball okay but not target or high performance loads	Rough or poorly shaped feed ramp	Polish or reshape ramp
Slide runs too far forward (rear of slide past rear of frame)	Broken barrel link or cams	Replace link, check all else for damage
Misfire	Excess headspace Insufficient firing pin protrusion Weak mainspring	Repair Replace pin Replace
Hard extraction	Rough or very dirty chambers	Clean or polish
Hard cylinder rotation when gun is empty	Bent crane or base pin Incorrect timing	Straighten or replace Retime
Hard cylinder rotation when gun is loaded with unfired cartridges	Insufficient headspace or too-thick case rims Insufficient barrel/ cylinder gap Rough or burred recoil shield	Repair File larger gap Polish smooth
Hard cylinder rotation when fired	Insufficient barrel/ cylinder gap Oversize firing pin hole Excessive chamber pressure	Open gap Replace bushing Check ammunition
Lead spits out barrel/ cylinder gap	Incorrect cylinder alignment Excess gap	Re-align Reduce gap
Cylinder won't turn at all after weak shot	Bullet stuck between barrel and cylinder	Push bullet back into cylinder with rod, check ammunition
Hammer does not rebound after firing	Broken rebound slide, lever, or spring	Replace
Trigger won't return after firing	Broken trigger return or rebound spring or lever	Replace
Hammer won't cock, but moves freely	Broken trigger nose or hammer	Replace
Hammer won't come all the way back	Burrs or parts interference inside	Inspect and repair or replace parts
Hammer won't stay cocked	Chipped or worn sear notch	Recut notch or replace hammer
Malfunction	Probable Causes	Corrective Action
Crane won't open when latch is actuated	Bent or broken crane lock	Replace
	Bent crane	Replace
	Firing pin jammed in primer or bushing	Check rebound system, check pin bushing
	Primer extruded into firing pin hole	Replace firing-pin bushing
	Expanded or ruptured case head	Check ammunition

Malfunction	Probable Causes	Corrective Action
	Bulged chamber	Replace cylinder, but check ammunition carefully
Gas blows out through bolt cut	Fault in cylinder or excessive chamber pressure	Replace cylinder, but check ammunition carefully
Gas-cutting on underside of top strap	Excessive barrel/cylinder gap and excessive chamber pressure	Heli-arc and reshape strap, but check ammunition
Cartridges won't seat fully in chamber	Dirt or rust	Clean and polish
	Excessive leading	Remove and polish
	Piece of broken case stuck in chamber	Remove and polish chamber
	Powder or debris under extractor	Clean
Hammer suddenly goes loose during cocking	Broken mainspring	Replace
Cylinder slips to rear and jams when open	Frame lug worn or polished too low	Replace lug (S&W) Replace side plate (Colt)
Front lock of S&W won't engage	Bent extractor rod or center pin	Straighten or replace
	Broken or jammed front plunger or spring	Replace
Extractor jams, even when gun is unloaded	Bent extractor rod	Straighten or replace
Hammer catches on edge of frame up near top strap	Loose side plate	Tighten
Malfunction	Probable Causes	Corrective Action
Loaded cylinder won't rotate when gun held muzzle up	Burrs on recoil shield	Polish smooth
Hammer jams at or past full cock	Parts interference inside Hammer is rotating too far back	Inspect and repair Build up rear of hammer for stop

Appendix VIII - USEFUL DATA

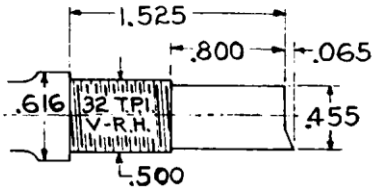
DECIMAL EQUIVALENTS OF FRACTIONS OF AN INCH

If you must work with only a fractional scale, this table will enable you to translate the dimensions given in the data section.

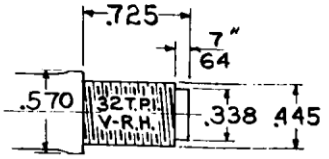
1/64	·015625	11/32	·34375	43/64	·671875
1/32	·03125	23/64	·359375	11/16	·6875
3/64	·046875	3/8	·375	45/64	·703125
1/16	·0625	25/64	·390625	23/32	·71875
5/64	·078125	13/32	·40625	47/64	·734375
3/32	·09375	27/64	·421875	¾	·750
7/64	·109375	7/16	·4375	49/64	·765625
1/8	·125	29/64	·453125	25/32	·78125
9/64	·140625	15/32	·46875	51/64	·796875
5/32	·15625	31/64	·484375	13/16	·8125
11/64	·171875	½	·500	53/64	·828125
3/16	·1875	33/64	·515625	27/32	·84375
13/64	·203125	17/32	·53125	55/64	·859375
7/32	·21875	35/64	·546875	7/8	·875
15/64	·234375	9/16	·5625	57/64	·890625
¼	·250	37/64	·578125	29/32	·90625
17/64	·265625	19/32	·59375	59/64	·921875
9/32	·28125	39/64	·609375	15/16	·9375
19/64	·296875	5/8	·625	61/64	·953125
5/16	·3125	41/64	·640625	31/32	·96875
21/64	·328125	21/32	·65625	63/64	·984375

METRIC CONVERSION TABLE			
MM	Inches	MM	Inches
1	·039	·1	·004
2	·079	·2	·008
3	·118	·3	·012
4	·157	·4	·016
5	·197	·5	·020
6	·236	·6	·024
7	·276	·7	·028
8	·315	·8	·031
9	·354	·9	·035
10	·394	1·0	·039
11	·433	1·1	·043
12	·472	1·2	·047
13	·512	1·3	·051
14	·551	1·4	·055
15	·591	1·5	·059
16	·630	1·6	·063
17	·669	1·7	·067
18	·709	1·8	·071
19	·748	1·9	·075
20	·787	2·0	·079
1 Millimeter	= ·03937 inches	1 gram	= 15·4324 grains
1 inch	= 25·4 millimeters	1 grain	= ·0648 grams

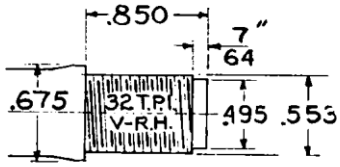
MISCELLANEOUS BARREL AND BARREL THREAD SPECIFICATIONS



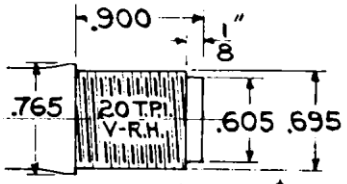
COLT WOODSMAN PISTOL.



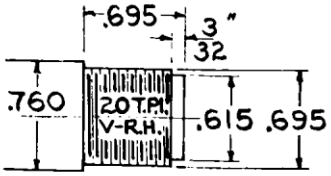
COLT POLICE POSITIVE & POCKET POSITIVE REVOLVERS.



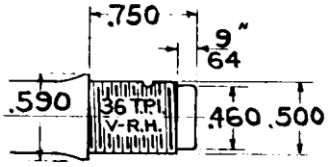
COLT D.A. ARMY, ARMY SPEC., & OFFICIAL POLICE REVOLVERS.



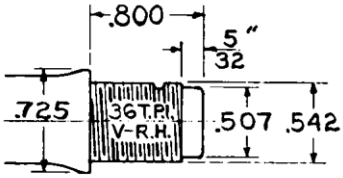
COLT NEW SERVICE & MODEL OF 1917 REVOLVERS.



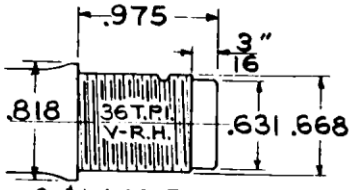
COLT SINGLE ACTION, BISLEY, & D.A. FRONTIER REVOLVERS.



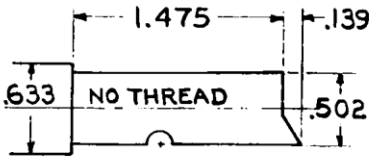
S.&W. .22/32 REVOLVER.



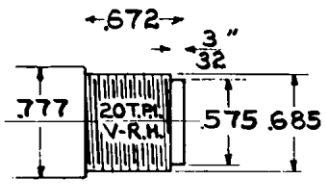
S.&W. "K" SERIES AND MIL. & POL. MODEL REVOLVERS.



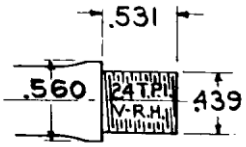
S.&W. MODEL OF 1917 REVOLVER.



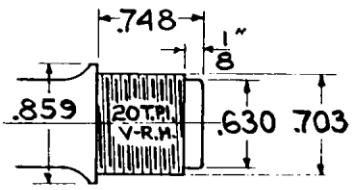
HI-STANDARD MODELS HB & HD-M PISTOLS.



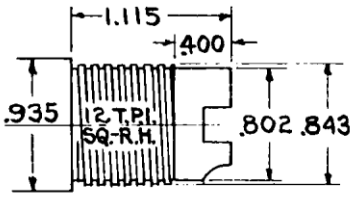
GREAT WESTERN REVOLVER (AMERICAN MADE).



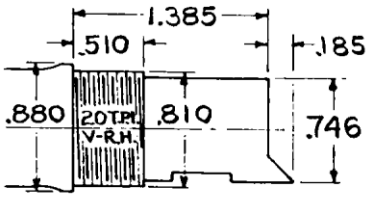
H.&R. MODEL 922 REVOLVER.



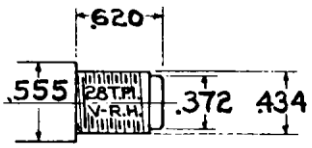
LUGER MODEL '08 PISTOL.



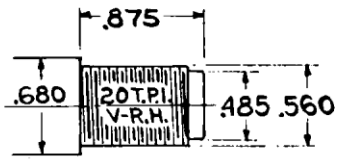
REMINGTON ROLLING-BLOCK PISTOL.



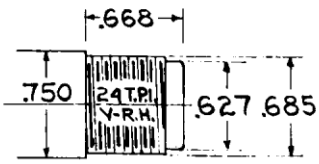
RUGER .22 AUTOMATIC & MARK I PISTOLS.



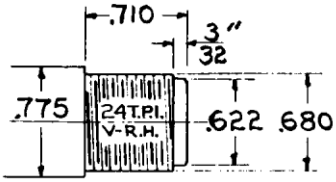
RUGER BEARCAT REVOLVER.



RUGER SINGLE SIX REVOLVER.



RUGER .357 BLACK HAWK REVOLVER.



RUGER .44 MAGNUM BLACK HAWK.

Appendix IX - Common Firearms Abbreviations

AE	Automatic ejectors
AP	Armor piercing in reference to bullets
API	Armor piercing incendiary in reference to bullets
AR	Automatic rifle
AS	Automatic safety
BB	Bevel base in reference to bullets
BC	Ballistic coefficient in reference to bullets
BCC	Battery cup primer
BN	Bottle neck in reference to a cartridge case
BP	Black powder
BPE	Black Powder Express in a cartridge designation
BT	Boat tail in reference to bullets; Beaver tail in reference to stocks
CF	Center-fire
Cl	Center of impact
CT	Copper tube in a bullet designation
DA	Double-action in a handgun
DB	Double barrel in reference to a gun; Double base in reference to powder.
DEN	Headstamp for Denver Ordnance Plant
DST	Double set trigger
DT	Double trigger
DWM	Deutsche Woffenundmunitions Fabrik, used as a headstamp and as a prefix to numerical cartridge designations.
EC	Headstamp for Evansville/Chrysler ammunition plant
Ex	Excellent in NRA condition standards.
ECS	Headstamp for Evansville/Chrysler/Sunbeam ammunition plant.
F	Fair in NRA condition standards
F	Fire, in reference to a gun safety
FA	Headstamp for Frankford Arsenal
FB	Flat base in reference to bullets
FC	Full choke in reference to shotguns; Full charge in reference to ammunition.
FC or FCC	Federal Cartridge Corporation
FP	Foot pounds in reference to energy
FPS	Feet per second in reference to velocity
FP	Full patch (FMJ) in reference to bullets
FMJ	Full metal jacket in reference to bullets
FS	Full stock
FW	Featherweight
G (Gew.)	Gewehr, German word for rifle
G	Good in NRA condition standards
GC	Gas check in reference to bullets
GR	G. Roth, used as a headstamp and as a prefix to numerical cartridge designations.
H	Hodgdon (B. E.) as a prefix in a powder designation
HB	Hollow base in reference to bullets; Heavy barrel in reference to barrels
HE	Hand ejector (ejection) in reference to a revolver
H&H	Holland & Holland, old-line British gun-making firm sometimes called “Hollands.”
HJ	Half jacket in reference to bullets
HP	Hollow point in reference to bullets; High Power in reference to cartridge or gun designations
Hy	Hornady Manufacturing Company
IC	Improved cylinder choke
IL	Inside lubricated in reference to bullets
Imp	Improved in a cartridge designation
IMR	Improved military powder as a prefix in a powder designation
JHP	Jacketed hollow point in reference to Super Vel bullets
JSP	Jacketed soft point in reference to Super Vel bullets
K (Kar.)	Karabine, German word for carbine
L	Lead in reference to bullets
LC	Headstamp for Lake City Arsenal
LC	Long Colt, in reference to handgun cartridges
LE	Lee Enfield rifle
LGS	Lyman Gun Sight Co.
LMG	Light machine gun
LP	Large pistol primer
LR	Large rifle primer
LW	Light weight
M	Model, as M-16 rifle

Mag	Magazine
MC	Metal case in reference to bullets; Monte-Carlo style comb in reference to stocks
MC or Mod	Modified choke
ME	Muzzle energy of a bullet in foot pounds
MH	Martini-Henry rifle or Merwin Hulbert revolver
MK	Mark, sometimes used instead of M or Model, as in Revolver, . 455, MKVI.
MOA	Minute of angle
MP	Metal point or metal piercing in reference to bullets
MR	Mean radius, average shot distance from center of impact
MRT	Mid-range trajectory height
MS	Mannlicher-Schoenauer rifle
MV	Muzzle velocity of a bullet in feet per second
N	Norma Projectilfabrik as a prefix in a powder designation
NC	Non-corrosive in reference to primers
NE	Nitro Express in a cartridge designation
NE	Non-ejector
NM	National Match, in reference to guns, equipment, or ammunition manufactured or selected specifically for the U. S. National Rifle & Pistol Matches.
NMNC	Non-mercuric, non-corrosive in reference to primers
NSE	Non-selective ejectors
OL	Outside lubricated in reference to bullets
OP	Over powder wad
OU	Over-under, barrels place one above the other. Sometimes indicates “Superposed.”
OS	Over shot wad
PB	Plain base in reference to bullets
PC or PCC	Peters Cartridge Co., in reference to a headstamp or ammunition label
PG	Pistol grip
PP	Paper patch in reference to bullets
PP	Power-Point (Winchester) or protected point, in reference to bullets; Police Positive in reference to Colt revolvers;
PPC	Pistole Polizei (Police Pistol) in reference to Walther pistols. Police Pistol Course, a course of fire used in training police in handgun marksmanship
PSP	Pointed soft point in reference to bullets
QD	Quick detachable
R	Sturm, Ruger, Inc.
RB	Rolling block (Remington) rifle or pistol
RE	Recoil energy
Rem-UMC	Remington-Union Metallic Cartridge Co.
RF	Rapid fire
RF	Rimfire
RGS	Redfield Gun Sight Co.
R-P	Remington-Peters
RPM	Rounds per minute in reference to cyclic rate of fire of an automatic weapon.
RV	Recoil velocity
S	Safe, in reference to a gun safety
SA	Savage Arms
SA	Single-action in a handgun; also Springfield Armory
SAA	Single-Action Army, a Colt revolver
SBS	Side-By-Side in reference to double barrel guns.
Sa	Sierra products
SB	Single base powder
SD	Sectional density in reference to bullets
SF	Slow fire
SL	Headstamp for St. Louis Ordnance Plant
SMG	Submachine gun
SMLE	Short Magazine Lee Enfield rifle
SO	Secant ogive, a term used by Hornady to describe a particular
SP	form of bullet ogive. Small pistol primer
Sp	Speer Products
SP	Spire point or soft point in reference to bullets
Spcl	Special, as in. 44 Special, in a cartridge designation
Spitz	Spitzer (pointed) bullet
SR	Small rifle primer
SR	Semi-rimmed in reference to a cartridge case
SRC	Saddle ring carbine
SS	Single shot

SST	Single selective trigger; also single set trigger
ST	Set trigger or single trigger
ST	Silvertip (Winchester-Western) in reference to bullets
S&W	Smith & Wesson
SWC	Semi-wadcutter in reference to bullets
S&W/F	Smith & Wesson Fiocchi
SV	Super Vel Cartridge Corp.
SX	Super X (Winchester-Western) in cartridge designations; also designated as a form of varmint bullet by Homady.
TD	Take-down
TW	Headstamp for Twin Cities Arsenal
TF	Timed fire
Tr	Tracer in reference to bullets
UMC	Union Metallic Cartridge Co.
Var	Variable, indicating variable magnification in a scope sight
VG	Very Good in NRA condition standards
VR	Ventilated rib
WC	Wadcutter in reference to bullets
WCC	Headstamp for Western Cartridge Co.
WRA	Winchester Repeating Arms Co.
W-W	Winchester-Western
X	Single-diameter magnification, i.e., 3X is magnification of 3 diameters.